

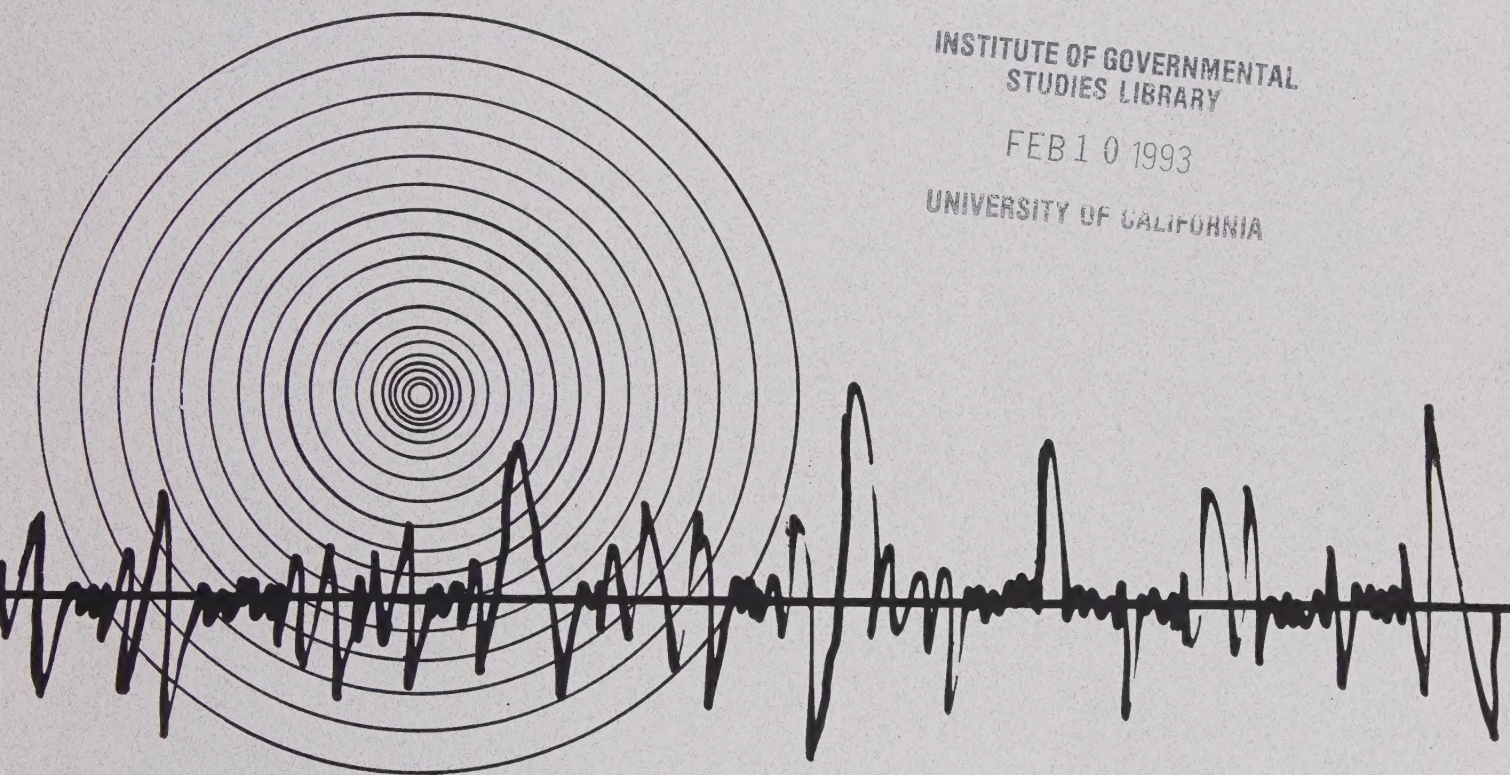
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# NOISE ELEMENT OF THE GENERAL PLAN

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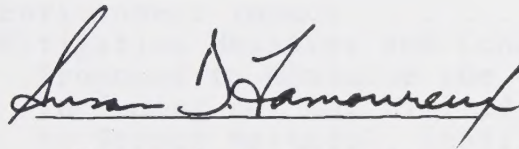
CITY OF SANTA MONICA



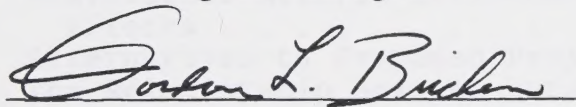
NOISE ELEMENT  
OF THE  
GENERAL PLAN

CITY OF SANTA MONICA

September 1975

A handwritten signature in dark ink, reading "Susan D. Lamoureux". The signature is fluid and cursive, with the first name "Susan" and last name "Lamoureux" clearly legible.

Susan D. Lamoureux  
Program Manager

A handwritten signature in dark ink, reading "Gordon L. Bricken". The signature is fluid and cursive, with the first name "Gordon" and last name "Bricken" clearly legible.

Gordon L. Bricken  
Manager, Environmental Studies

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Anaheim, California 92805



# T A B L E   O F   C O N T E N T S

<u>Section</u>		<u>Page</u>
1	INTRODUCTION. . . . .	1
	The Noise Problem . . . . .	1
	Legislative Mandate . . . . .	10
	Purpose and Features. . . . .	11
	Relationship to Other General Plan Elements. . . . .	12
2	GOAL AND OBJECTIVES . . . . .	15
3	METHODOLOGY . . . . .	17
	Identification of Major Noise Sources . . .	17
	Santa Monica Noise Environment. . . . .	25
	Source Characteristics of Specific Land Uses in Santa Monica. . . . .	34
	Citizen Input . . . . .	43
	Noise Standards and Criteria. . . . .	43
	Opportunities, Obstacles and Constraints. .	45
4	IMPLEMENTATION. . . . .	49
	Priorities for Noise Control Efforts. . . .	49
	Recommendations . . . . .	50
	Existing Federal and State Standards. . . .	60
	Action Programs . . . . .	67
5	ENVIRONMENTAL IMPACT. . . . .	85
	A. Environment Impact. . . . .	85
	B. Mitigation Measures and Conditions Proposed to Minimize the Impact, Including but not Limited to Measures to Reduce Wasteful, Inefficient, and Unnecessary Consumption of Engery . .	88
	C. Unavoidable Adverse Environmental Effects . . . . .	88
	D. Alternatives to Proposed Project. . . .	89
	E. The Relationship Between Local Short- Term Uses of Man's Environment and Enhancement of Long-Term Productivity. . . . .	91
	F. Irreversible and Irretrievable Commit- ment of Engergy Supplies other Resources should the Project be Implemented . . . . .	91
	G. The Growth-Inducting Impact of the Proposed Action . . . . .	92



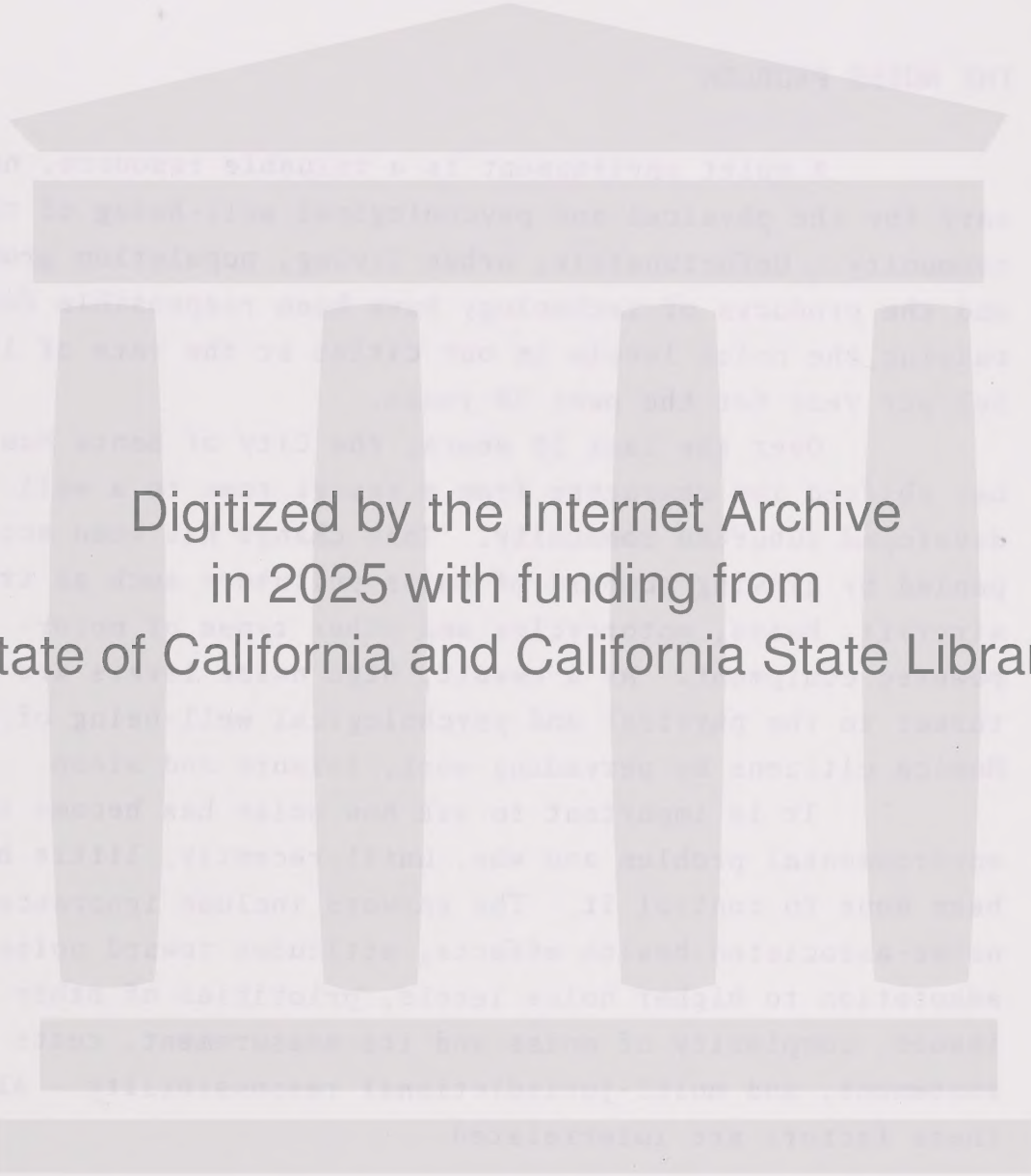
## INTRODUCTION

### THE NOISE PROBLEM

A quiet environment is a valuable resource, necessary for the physical and psychological well-being of the community. Unfortunately, urban living, population growth and the products of technology have been responsible for raising the noise levels in our cities at the rate of 1 decibel per year for the past 30 years.

Over the last 50 years, the City of Santa Monica has shifted its character from a resort town to a well developed suburban community. This change has been accompanied by growing numbers of noise polluters such as trucks, aircraft, buses, motorcycles and other types of motor-powered equipment. As a result, high noise levels are a threat to the physical and psychological well-being of Santa Monica citizens by pervading work, leisure and sleep.

It is important to ask how noise has become an environmental problem and why, until recently, little has been done to control it. The answers include ignorance of noise-associated health effects, attitudes toward noise, adaptation to higher noise levels, priorities of other issues, complexity of noise and its measurement, costs of abatement, and multi-jurisdictional responsibility. All of these factors are interrelated.



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## Health Effects

Fundamental to the concern for noise pollution is its harmful effects on human beings. These effects of noise on people range from annoyance and inconvenience to temporary or permanent hearing loss. In addition to hearing loss, physical disorders attributable to noise include chemical and physiological reactions involving the heart, blood, skin, eyes, and stomach. Adverse psychological responses range from frustration to fear with unconscious disruptions of the nervous system.

Noise also has adverse effects on other human activities such as communications, sleep, and work performance, thereby contributing to annoyance and indirectly affecting the general health and well-being of an individual.

Certain age groups are particularly affected by an adverse noise environment. Older people usually have suffered from hearing loss over time and consequently have trouble defining certain sound levels. Young children have difficulty understanding adults because they have not learned to distinguish between the sounds of words and environmental noise. This can be a significant problem in the learning process because many schools are located near noisy roadways.

## Noise Attitudes

One of the greatest obstacles to creating a quiet environment lies in people's attitudes toward noise. Noise is often equated with better performance. In many cases, persons refuse to buy quieter equipment which is identical in every other way to noisier machines. Actually, noise has little to do with performance. The use of noisy machines endangers a person's hearing and work performance and contributes to higher noise levels in the community.



## Adaptation

Many people believe they can adapt to noise. Normally, adaptation to environmental conditions is a common occurrence. Unfortunately, there is little physical adjustment to noise by the human body. The ear does not adapt to high noise levels but suffers various degrees of hearing loss. Hearing loss may be falsely recognized as mental adjustment. In addition, people may partially adjust to noise during sleep but the quality of sleep will be lessened.

## Priorities of Other Issues

Noise pollution is invisible thus attracting far less attention than air and water pollution. In addition, major social concerns such as housing and crime often must take priority over programs to reduce noise. It is important, however, to recognize the relationship between noise and other societal ills. Noise is directly related to the design of the City and thus the livability of the City's environment. If buildings and homes are felt to be undesirable because of adverse noise levels, high tenant turnover and building deterioration are likely to occur or to accelerate. As the entire urban environment becomes subject to noise pollution in conjunction with other urban problems, the impairment of the economic health and growth potential of the City may follow and thereby reduce the desirability of the City as a place to live.

## Complexity of Noise and its Measurement

Noise is a highly technical subject and thus often difficult for the nonengineer to understand. More detailed information can be found in Report 1 of the Noise Element Study.



Sound is created when an object vibrates and radiates part of its energy as acoustic pressure fluctuations or waves through a medium such as air, water, or a solid. The ear, the hearing mechanism of humans and most animals, receives these sound pressure waves and converts them to neurological impulses which are transmitted to the brain for interpretation.

Sounds may be perceived as loud, soft, noisy, quiet and high- or low-pitched. These subjective terms are all relative and do not convey technical information about the sound. There are two parameters that are used technically to describe simple sounds:

- o Amplitude - In units of decibels (dB). The amplitude of a sound is a measure of the pressure or force that a sound can exert. Subjectively, a sound is louder if it has an amplitude larger than another sound. Thus, the amplitude of sounds can be described either in terms of measurable magnitude in dB or in relative terms of loudness.
- o Frequency - In units of Hertz (Hz.) The unit of frequency, Hertz, means cycles per second and refers to the number of times that the acoustic pressure (amplitude) peaks in each second. Subjectively, a sound that has more cycles per second is higher pitched. High-pitched sounds are produced by a rapidly vibrating sound source and conversely, low-pitched sounds are from a more slowly vibrating source.

The range of frequencies that sound may have is dependent on the medium through which it propagates. In



air, sound may have frequencies from less than 1 Hz to over 50,000 Hz. Various species of animals perceive sound in different frequency ranges because of the characteristics of their auditory systems. Humans perceive sound in the frequency range from approximately 20 Hz to 20,000 Hz. However, the human ear is not equally sensitive to all frequencies. Normally, people are most sensitive to the frequencies between 1,600 Hz and 5,000 Hz.

Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale was devised to relate noise to human sensitivity. The A-weighted dB (dBA) scale performs this compensation by discriminating against frequencies both above and below 1,000 Hz in a manner approximating the sensitivity of the human ear.

The decibel (dB) unit is a mathematically comparative measure, using the logarithm. The decibel (dB) is not unique to the field of community noise, also being used frequently in electrical engineering and physics. It is a mathematical way of comparing two quantities by taking the logarithm of their ratio. In the A-weighted sound scale, the basis for comparison is the faintest sound audible to the average, young, male, human ear at the frequency of maximum sensitivity.

Doubling the sound pressure of a noise source causes the decibel rating to be increased by only 6 dB due to the logarithmic nature of the noise scale. However, due to nonlinearities in the mechanism of the human ear, a sound must be nearly 10 dBA higher than another to be judged twice as loud. It follows that a sound of 20 dBA is four times as loud and 30 dBA is eight times as loud. Decibels usually describe single noise events.

Everyday sounds normally range from 30 dB (very quiet) to 100 dB (very loud). The average level of conversation ranges from 60 to 80 dB. Sound becomes discomforting



at 120 dB and physically painful above 140 dB. Examples of various sound levels are shown in Figure 1.

Several rating scales have been developed for the measurement of community noise. These scales average several noise events. These scales account for:

- a) The parameters of noise that have been shown to contribute to the effects of noise on man.
- b) The variety of noises found in the environment.
- c) The variations in noise levels that occur as a person moves through the environment.
- d) The variations associated with the time of day.

The predominant scales now in use in California are: Energy Mean Noise Level ( $L_{eq}$ ); Noise Level Exceeded 10 percent of the Time ( $L_{10}$ ); Day-Night Average Sound Level ( $L_{dn}$ ); and Community Noise Equivalent Level (CNEL). These noise indices apply different weighting factors to noise occurring at various times of the day.  $L_{eq}$  is the level of constant sound over a given time interval and situation which has the same sound energy as time-varying noise over the same time period.  $L_{dn}$  is similar to  $L_{eq}$  but applies a weighting factor which places greater significance on noise events occurring at night (10:00 p.m. to 7:00 a.m.) than during the days (7:00 a.m. to 10:00 p.m.). For example, a train that operates at night is considered ten times as noisy as a day train. CNEL is also similar but with weighting factors placed on two time periods (evening, 7:00 p.m. to 10:00 p.m. and night, 10:00 p.m. to 7:00 a.m.). Thus, when a noise value is given for a particular location, it is



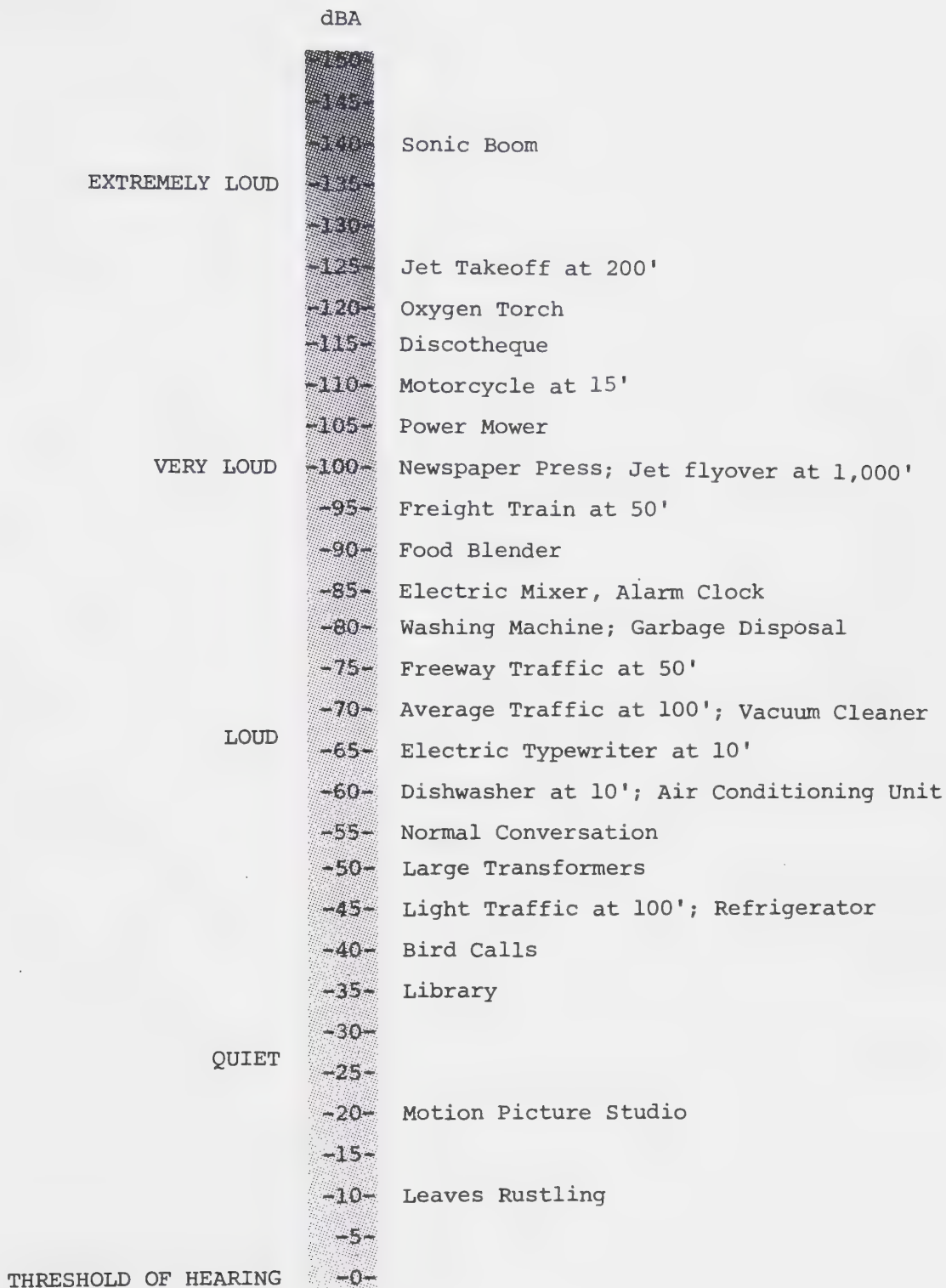


Figure 1. NOISE SCALE



important to identify the measurement index. These noise indices incorporate factors of amplitude and spectral distribution of noise, sensitivity of the human ear, duration of noise events, and time-of-day weighting factors.

In addition, noise from many sources varies over a period of time so that the noise level is not constant. Under conditions of time-varying noise, sound becomes a statistical phenomenon which can be described properly only by statistical parameters. Over the years, this fact has led to some confusion in the use of acoustical terminology. The terms most frequently used are "ambient," "background," "median," "residual," "mean," and "modal."

Ambient noise is the surrounding or pervading noise environment at a location. Therefore, it does not refer to the noise levels from any given source, but represents a merging of all sources. The background noise in an environment refers to the noise level present after all identifiable sources have been removed from consideration. Background noise fluctuates less with time than does ambient noise. This term is more descriptive of conditions that exist at a site than is the sound level value at any given point in time which may include noise from a transitory source.

Other statistical terms in common usage are the "mean" noise level (the average of the value of all events occurring at a location) and the "modal" noise level (the most frequently occurring noise level at a location). Thus, the description of sound at a location can be complex. When a noise level is given for a particulate location, it is important to know what statistical characteristic is described by that noise value.

In recent years, qualitative terms have been replaced by statistical descriptions of ambient noise. Noise values are given statistically in percentiles. For example, the 90th percentile value existing at a measurement location is the noise value exceeded 90 percent of the time.



It is abbreviated by the term  $L_{90}$ . Various percentile values have come into common use to describe the characteristics at a location among them being the  $L_{90}$ , the  $L_{50}$ , the  $L_{33}$ , and the  $L_{10}$ . The  $L_{50}$  value is also called the "median" noise level. The  $L_{90}$  value is called the "residual" noise level. The average continuous equivalent level of noise is called  $L_{eq}$ .

### Costs of Noise Abatement

As with most forms of environmental pollution, prevention or control of noise-related hazards may entail high economic costs. These costs may be particularly high in developed areas which require remedial noise control measures. However, the justification of these costs is based on protecting human health and reducing the physical and mental damage associated with noise.

It is extremely difficult to attach any figure to the net total costs ensuing from community noise control efforts in Santa Monica. Economic costs of noise abatement are difficult to assess and it is even more difficult to quantify social and health costs associated with not abating noise.

### Multijurisdictional Responsibility

The Federal Noise Control Act of 1972 established respective jurisdictions for Federal, state, and local governments. The state and local governments are given primary responsibility for noise control. However, Federal jurisdiction is reserved for noise related to interstate and foreign commerce. Many of the major community noise sources such as airplanes, trucks, and railroads are under Federal jurisdiction because they are associated with commerce.



Local governments receive their regulatory powers from their police power to protect the health and welfare of their citizens as long as the regulations are not preempted by Federal and state laws. In most cases where preemption of noise sources exists, the local government assumes the role of enforcing the Federal and state laws.

Local government can play a significant role in the control of noise sources by supporting Federal and state efforts to control noise. Even more effective is control of the noise path and receiver by local government. These techniques include establishing traffic regulations, adopting noise ordinances, and regulating noise through the control of land use.

Unfortunately, noise does not respect jurisdictional boundaries, and noise generated in one community may affect another. It is essential, therefore, that all levels of government cooperate to achieve the maximum obtainable reduction of noise.

#### LEGISLATIVE MANDATE

The State of California has recognized the seriousness of urban noise pollution and has responded by mandating the requirement of a Noise Element to the General Plan. Section 65302(g) of the California Government Code states that the General Plan shall include:

A noise element in quantitative, numerical terms, showing contours of present and projected levels associated with all existing and proposed major transportation elements.

- (1) Highways and freeways,
- (2) Ground rapid transit systems,
- (3) Ground facilities associated with all airports under a permit from the State Department of Aeronautics.



These noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency and its occurrence. The recommended scale is sound level A, as measured with A-weighted network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.

Noise contours shall be shown in minimum increments of five decibels and shall be continued to 65 dB(A). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 dB(a).

Conclusions regarding appropriate site or route selection, alternative, or noise impact upon compatible land uses shall be included in the general plan.

The state, local or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan, a statement of the present and projected noise levels of the facility, and any information which was used in the development of such levels.

On September 20, 1973, the California Council on Intergovernmental Relations (CIR) issued guidelines for the preparation of noise elements that both extended the scope of a noise element and modified the content as prescribed by the legislative mandate.

The City of Santa Monica has prepared this Noise Element in response to both the State law and the CIR Guidelines.

## PURPOSE AND FEATURES

The purpose of the Noise Element is to provide a guide for City officials, other concerned governmental



agencies, and individual citizens concerned with achieving a quieter environment. The Element is intended to establish policy and program uniformity in regard to actions taken to eliminate or minimize noise pollution in Santa Monica.

The Noise Element provides an outline for a comprehensive noise control program. It identifies the sources of community noise, analyzes the extent of noise pollution, and estimates the potential impact upon the City. This identification process in turn provides the basis for goals, objectives and implementation programs designed to create a quieter environment in the City of Santa Monica.

All noise control programs outlined in the Noise Element imply a commitment of community resources to fulfill program objectives. The City must first establish the criteria for a quiet environment, based on accepted health and welfare data, and coordinate these criteria with the noise criteria of other local, State and Federal agencies. Implementation programs must be based on a balance of what is practically achievable against what is merely desirable. The primary consideration should be to balance the benefits of a quieter environment against the technological feasibility and economic viability of the proposed programs to achieve such an environment.

Specifically, the Noise Element contains introductory material, a statement of goals and objectives, the methodology used to describe the City's noise environment, and implementation measures. More detailed technical and descriptive information is contained in appendices to this Element.

## RELATIONSHIP TO OTHER GENERAL PLAN ELEMENTS

The General Plan has become an important instrument which elected officials can use to provide policy



guidance for more detailed planning and implementation. To some degree, all elements of the General Plan are related and interdependent. The Noise Element is closely related to a number of other elements of the General Plan, primarily Land Use, Circulation, and Housing.

The Land Use Element, which designates the proposed distribution, general location, and extent of the uses of land, is related directly to noise levels. Through proper land use planning, categories of effective noise level criteria can be maintained. Specifically, the Land Use Element should be modified to incorporate the land use/noise standards of the Noise Element.

These standards are directed toward the compatibility of land use with certain noise levels of which residential use is the most sensitive. City actions have an important impact on housing: where and how it is built, and how it is maintained. The Land Use Element in conjunction with the Housing Element can insure that noise impacts are considered in planning decisions related to new residential construction and location. Strict enforcement of noise insulation standards will help prevent deterioration of neighborhoods impacted by noise. Special noise consideration in design and acoustical treatment as well as location is particularly important for multiple-family units where noise levels tend to be high.

The Circulation Element outlines the movement of people and goods in the City and thus is a physical determinant of land use. At the same time, transportation systems are major noise sources. The Circulation Element should be modified to include adequate consideration of noise impacts. Changes should be made in the existing circulation system to reduce the noise impact upon noise-sensitive areas. For new transportation facilities, noise levels should be a decisive factor in the design and location of such facilities.



## GOAL AND OBJECTIVES

From the Citizens Advisory Committee:

GOAL: Identify and control noise levels appropriate to specific areas consistent with mental and physical health and enjoyment of the environment.

- OBJECTIVES:
1. Designate noise level limits desirable for residential, business, industrial, and recreational areas.
  2. Minimize noise effects within the City by monitoring and controlling their sources.
  3. Set standards and requirements such that engineering can play an integral and important role in design and planning.
  4. Provide for active programs for noise abatement.



## METHODOLOGY

### IDENTIFICATION OF MAJOR NOISE SOURCES

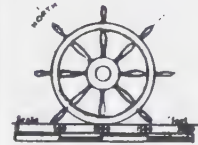
A multitude of noise sources combine to produce the noise environment of the City of Santa Monica. Identification of these noise sources is the first step in community noise control efforts.

The identification of noise sources in the Santa Monica noise environment utilized two different types of data. First, the existing and projected transportation noise sources were determined by computer simulation models which develop noise contours. These contours graphically portray the distribution of transportation noise in the City. Contours for existing and projected transportation facilities accompany this element. Secondly, a community noise survey was conducted containing 98 measurement sites and four 24-hour sites. The results are available in Report 2 of the Noise Element Study. These measurement locations provided a wide coverage of existing community noise sources and were representative of all types of land uses within Santa Monica. The general locations of the survey are shown in Figure 2.

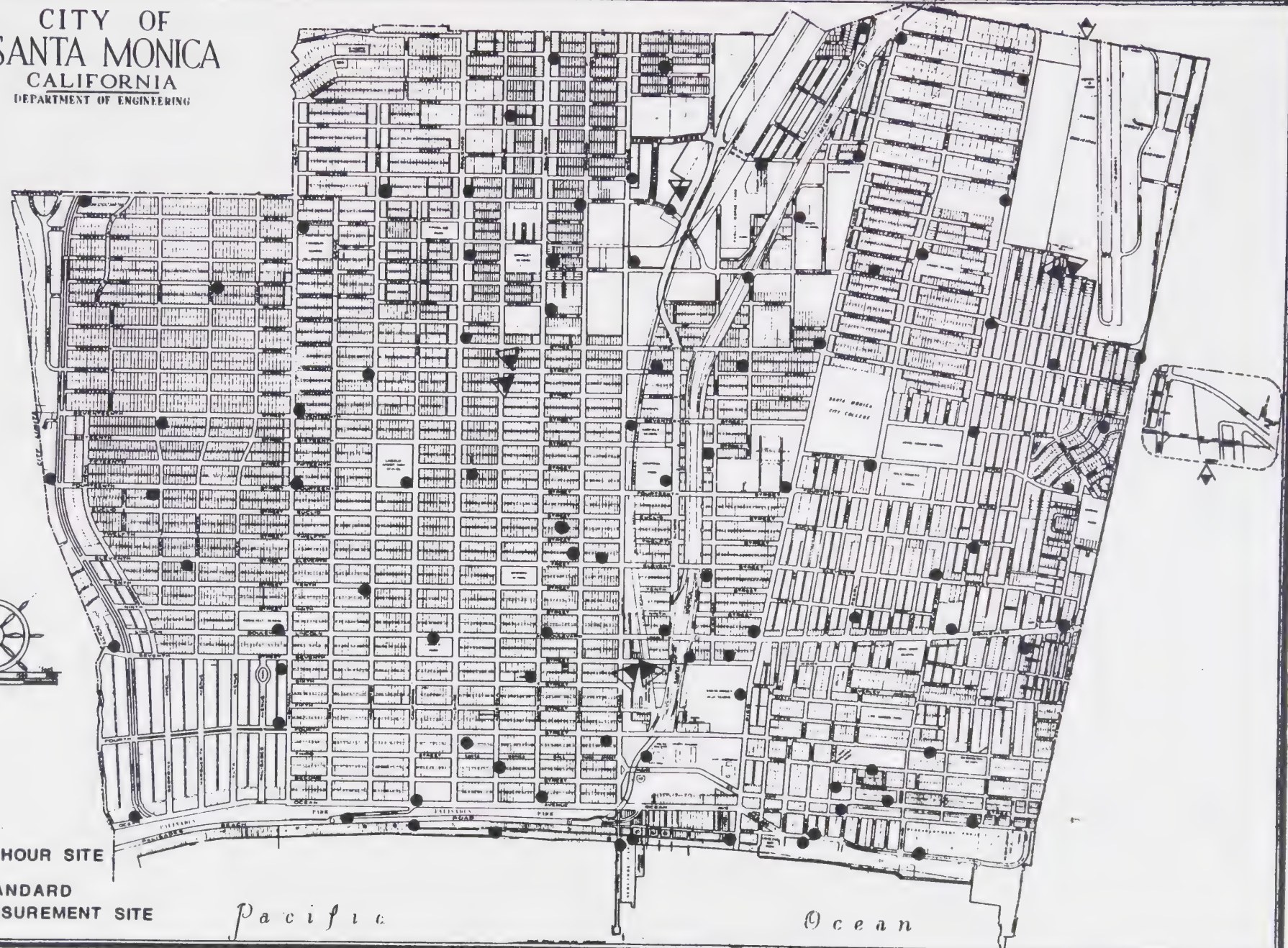
The community noise survey was taken for two specific purposes. First, the information was used to develop a noise profile of Santa Monica. Secondly, the



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- ▶ 24 HOUR SITE
- STANDARD MEASUREMENT SITE



CITY OF SANTA MONICA NOISE SURVEY SITES

FIGURE 2.



information serves as a convenient benchmark of the noise environment to be used for evaluation purposes relative to specific land use applications and relative to assessing changes in the noise environment in future years. Since it is not anticipated that the noise environment will change rapidly in Santa Monica, the true usefulness of the survey for comparative purposes on a community-wide basis will only become evident after several years have passed. At that time, it would be possible to repeat the survey in a systematic manner identical to the process of data taken originally and compare the results of those taken in the benchmark year.

More importantly, the survey is a useful tool in which to assess the environment over the next several years for purposes of land use planning, land use changes, and the development of specific plans at definite locations for the abatement of noise. For example, if there was a desire to install a stop sign at a location at an intersection where there was no stop sign in any direction, the change in noise that would result could be fairly accurately predicted by locating a site in the survey that had a similar stop sign configuration and compare the results in one instance with the condition in the other so as to assess the differential change. Similarly, in situations where the development is near a location of a site, the site's measurement data can be used as fairly characteristic of the situation at the development. Lacking a specific site near a proposed development, it may be possible to find a similar condition within the survey by which to assess a potential impact upon the development from the various noise sources.

The noise contours and the community noise survey also substantiate each other. The existing noise contours and the survey provide a description of the current noise environment. The measurement survey validates the contour analysis. The projected noise contours can be compared to the existing noise environment.



Santa Monica will utilize this background data in evaluating the plans and future development of the City. In addition, the survey provides baseline data to assess improvements in the City's noise environment.

The noise environment of the City of Santa Monica is created primarily by transportation facilities. Noise is generated by automobiles, trucks, buses, motorcycles, aircraft, and trains traversing the City. Secondary noise sources include industrial, construction, and population activities.

### Transportation Noise

Transportation noise in Santa Monica is generated by land and air transportation systems. The key elements of the surface transportation system of Santa Monica include the Santa Monica Freeway, Wilshire Boulevard, Santa Monica Boulevard, San Vicente Boulevard, Ocean Park Boulevard, Montana Avenue, Colorado Avenue, Palisades Beach Road, and Lincoln Boulevard. A Southern Pacific Railway line runs east-west providing rail services. Air transportation services are provided by Santa Monica Municipal Airport which lies in the southeast portion of the City. Noise from these transportation facilities and sources is difficult to control because of extensive preemption of regulatory control of these facilities and their use by the Federal and State governments.

Transportation-related noise is, by nature, exceedingly variable which makes it difficult to portray graphically. The frequency of vehicle movement varies widely as do the sound characteristics of each vehicle. Also, land forms and man-made structures have effects on sound transmission and, therefore, on the noise environment.

The most effective method of portraying transportation noise is by noise contours supplemented by noise measurements. Noise contours are developed from computer simulation



models which calculate the noise environment along transportation routes based on vehicle operating characteristics. These models produce noise contours which graphically display the mechanism of sound propagation away from transportation noise sources.

Noise contours are lines of equal noise exposure, just as the contour lines on a topographic map are lines of equal elevation. The accuracy of the contour line ultimately depends on the precision of the data used in developing a map. Land contours, for example, are mapped using detailed aerial photographs supplemented by land surveys with precision photogrammetric equipment. Such contours are very detailed and very accurate (in the order of several feet). Weather maps take daily data supplied by weather stations distributed many miles apart and by weather satellites. These data are fed into computers where mathematical models extrapolate the data into contour maps. The contour lines are accurate to within several tens of miles. Weather maps are very broad estimates, whereas land maps are very precise estimates.

Noise contours tend to be very broad estimates of sound levels. The contour lines are approximations of transportation noise impact boundaries over a 24-hour period using the  $L_{dn}$  noise index. They should not be thought of as static lines because of the varying nature of noise sources and transmission paths.

Noise contours for Santa Monica were prepared for the existing and a projected transportation system (see Implementation). The contours were mapped for levels of  $60 L_{dn}$  and greater. The CIR Guidelines also request that contours be developed down to levels of  $45 L_{dn}$  in the vicinity of hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas. In the case of Santa Monica, these lower levels are not shown because the ambient noise levels exceed  $45 L_{dn}$ .



The noise contour levels generated for Santa Monica were compared to noise levels obtained in the noise measurement survey of the City. In the majority of sites, noise levels for both the survey and contours were correlated. Discrepancies resulted when other factors were involved such as barriers or structures which were not part of the computer noise contour model.

### Surface Transportation

Automobiles produce the major surface noise in Santa Monica. Noise associated with passenger vehicles is generated by the engine, tires, and muffler system and depends on road conditions and speed. Generally, noise levels generated by autos are greater for high speeds than for low speeds. At speeds above 50 miles per hour, tire noise predominates over engine noise. In general, trucks and buses generate noise levels that are at least twice as loud as, or 5 to 10 dBA greater than, general automobile traffic. This general guide was substantiated by the measurement survey data included in Report 2 of the Noise Element Study where automobiles measured 61 dBA whereas a City sanitation truck recorded a level of 75 dBA (Site 4). Truck and bus noise is not as dependent on speed as automobile noise. Truck and bus noise levels (65-85 dBA) depend on road and traffic conditions such as the presence of curves and grades and whether or not the vehicle is accelerating.

The measurement survey indicated that buses were a primary noise generator in Santa Monica. Diesel-powered motor buses operate extensively within the city limits of Santa Monica. Bus routes from both the City of Santa Monica Municipal Busline and the Southern California Rapid Transit District extend into residential areas as well as on the major arterials. During the measurement survey, it was found that buses were emitting peak noise levels as high as



90 to 92 dBA whereas the majority of automobiles emitted noise levels ranging from 70 to 80 dBA.

Motorcycle noise is one of the most annoying aspects of transportation noise. New motorcycles are regulated by noise standards, and the muffling system is sealed by the California Highway Patrol. Unfortunately, many of the mufflers are modified, resulting in excessive and annoying noise levels. Motorcycle noise levels recorded in Santa Monica ranged from 70 to 85 dBA. It has been determined that motorcycles are the biggest violators of legal noise limits in California according to a Highway Patrol survey of 1.18 million motor vehicles. The noise survey found that 16 percent of the motorcycles checked were in violation of noise standards, compared to 2 percent of the automobiles and trucks and only 1 percent of the trucks over 6,000 pounds. While motorcycles generate a large number of complaints in Santa Monica, they are only a small percentage of the overall traffic volume.

#### Air Transportation

Air transportation noise is generated by airport operations and aircraft overflights. Santa Monica is exposed to both of these types of aircraft noise from the Santa Monica Municipal Airport and Los Angeles International Airport.

The Municipal Airport is currently used as a general aviation field. The measurement survey (Site 97) recorded noise levels associated with a wide variety of aircraft operations. Single-engine aircraft takeoffs from Santa Monica Municipal Airport ranged from 77 to 80 dBA. Jet aircraft landing at Los Angeles International Airport peaked at 61 dBA.

The measurement survey also indicated that noise levels underneath the flight path of the Municipal Airport



ranged from 58 to 68  $L_{dn}$ . The areas within the Airport contours exhibited noise levels of 62 to 63  $L_{dn}$ . These aircraft levels are comparable to, if not lower than, noise levels generated by vehicular traffic. This indicates that the City should place as much emphasis on surface transportation noise as it does on air transportation noise. Aircraft noise generates more complaints than ground traffic noise because of a difference in perception. Areas juxtaposed to streets are almost continuously exposed to high noise levels; thus residents may psychologically adjust themselves to the situation. Aircraft noise is perceived as a more prominent problem because of its intermittent nature.

### Industrial Noise

Industrial operations produce a wide variety of noise. Annoyance associated with industrial noise depends on the proximity to noise-sensitive land uses such as residential areas. Other factors include whether the noise is continuous or occurs only a portion of the day and whether it is impulsive or irregular.

The measurement survey provided an example of the intrusive nature of industrial noise (Site 31). During the day, residual noise measurements of 53 dBA were set by traffic; however, residual levels at night were set at 47 dBA by a steam outlet which was masked by traffic during the day.

Industrial noise is a problem in areas where no buffer zone exists between residential and manufacturing districts. In this situation (Sites 86 and 87), industrial noise establishes background noise levels for the residential land use. At one location (Site 87), a background noise level of 66 dBA is set by generators at the Water Department.



## Construction Noise

Construction noise creates special problems because of its temporary nature. The frequency and intensity of the noise varies for the different work phases of a construction project. Construction noise is primarily produced by machinery and trucks. The Federal government is in the process of establishing standards for various types of construction equipment. Construction noise was monitored during the measurement survey (Site 19). Construction at this locale produced peak noise levels of 75 dBA.

## Population Noise

Population noise is the most diverse type of community noise. It includes noise generated by all types of human activities such as recreation, entertainment, household equipment such as lawnmowers and air conditioners, children and animals. The two types of population noise that generate the most nuisance complaints are barking dogs and musical instruments and/or stereos. Barking dogs produce noise levels of 60 to 65 dBA.

## SANTA MONICA NOISE ENVIRONMENT

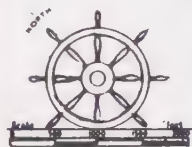
In order to assess the acoustical environment more specifically, the City was divided into study areas for ease of comprehension and determination of characteristics indigenous to specific geographic locations. The City was divided into six study areas, as shown in Figure 3.

### Area 1

Area 1 is located west of Montana Avenue, east of San Vicente Avenue, north of Ocean Avenue, and south of 26th



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- ▶ 24 HOUR SITE
- STANDARD MEASUREMENT SITE



STUDY AREA MAP  
FIGURE 3.



Street. Area 1 is basically made up of single-family and some multiple-family residential use. The homes range in age from 80 years to recent developments of multiple-resident family dwelling units. This area contains the highest socioeconomic group in Santa Monica.

There are 14 measurement sites within Area 1. The noise levels overall range from 52  $L_{dn}$  to 71  $L_{dn}$ . The noisiest areas are adjacent to Montana Avenue where noise levels range from 65  $L_{dn}$  to 70  $L_{dn}$ . These high noise levels can be directly attributed to the high traffic volume within this study area. Additionally, those measurement locations adjacent to San Vicente Boulevard exhibit relatively high noise levels ranging from 60  $L_{dn}$  to 69  $L_{dn}$ , also directly attributed to vehicular traffic. The northeastern portion of Area 1 has noise levels that are much lower than those on the periphery. The levels range from 52  $L_{dn}$  to 65  $L_{dn}$ . The quietest site measured in Area 1 is located near 22nd Street and Margarita (Site 95). This site exhibited a measured  $L_{dn}$  of 52 with a low nighttime measurement of 24  $L_{dn}$ . In general, Area 1 is relatively noisy for residential land use. The Environmental Protection Agency has set a level of 55  $L_{dn}$  as guideline for outdoor noise levels in a residential area.

Future development in Area 1 should be limited to single-family residential units and/or lower density than what currently exists. On the periphery of Area 1, a higher density residential use should be utilized as a buffer zone.

## Area 2

Area 2 is bordered on the south by 16th Street, on the west by Montana Avenue, on the east by Broadway, and on the north by the City boundary. Area 2 is primarily made up of single-family and low-density, multiple-family dwelling units with strip commercial development along Broadway and



Montana. Noise in Area 2 is created by high-density or high-volume vehicular traffic. The noise levels within Area 2 range from a low of 59  $L_{dn}$  to a high of 74  $L_{dn}$ . Area 2 also had a 24-hour measurement site (Site 1A, 1B, 1C, 1D) which indicated that 24-hour  $L_{dn}$  values ranged from 60 to 63  $L_{dn}$ . The area has high noise levels for its particular mixture of land use.

The quietest portion of Area 2 is located in the southwest corner near 18th Street and Idaho (Site 81). The noisiest areas are located near 26th and Wilshire (Site 92) and Santa Monica and Franklin Streets (Site 89). These two sites have  $L_{dn}$  values of 74 and 72, respectively. The adjacent commercial land use on Wilshire acts as a buffer and helps to attenuate the noise in the residential areas adjacent to Wilshire. This is also true for areas along Santa Monica Boulevard. The residential areas in the northwest portion of Area 2 exhibit noise levels from 63  $L_{dn}$  to 67  $L_{dn}$ .

Future development in Area 2 along the major arterials should be commercial (2 to 3 stories) to act as buffers for the residential units within the interior sections. Future land use planning should stress single-family or low-density, multiple-family units with an improved circulation plan to funnel the traffic out of this area, as well as inhibit large commercial vehicles from passing through the more noise-sensitive residential land use. As a result, any future developments, either single-family or multi-family residential use, should be required to have sound attenuation treatment under the criteria set forth in the Uniform Building Code, 1973 Edition, Chapter 35 and the California Administrative Code, Article 4, Section 216.

### Area 3

Area 3 is bounded on the west by Montana Avenue, on the north by 16th Street, on the east by Broadway, and on



the south by the Pacific Ocean shoreline. The basic land use in Area 3 is a mixture of high-density residential, commercial, and some public facilities. There are very few areas within this study section that have single-family dwelling units. The majority of units are older apartment buildings with an elderly clientele.

The noise levels within Area 3 range from a low of 62  $L_{dn}$  to a high of 74  $L_{dn}$ . Area 3 is extremely noisy with most sites exhibiting noise levels from 66  $L_{dn}$  and above. The high noise level areas are along Ocean Avenue, Wilshire Boulevard, and Lincoln Boulevard. These high noise levels are created by high-volume traffic traveling through the City. The quietest area measured in Area 3 is near 10th Street and Washington Avenue. This particular site (Site 73) measured an  $L_{dn}$  of 61, with a nighttime low of 36 dBA. The remainder of sites indicated nighttime lows of 40 dBA or above, with a measured  $L_{dn}$  of 66 to 74.

However, these high noise levels may be reduced in the future, with commercial development taking place along major traffic arterials. This development would act as a buffer for the residential areas juxtaposed to the major traffic arterials. This land use transition to commercial and office developments should particularly occur along Wilshire Boulevard and Santa Monica Boulevard in order to protect residents of Area 3. There is no other place within the City of Santa Monica that has noise levels consistently as high as Area 3. Therefore, it is imperative that the City reevaluate their current land use and redevelopment programs in order to incorporate some noise attenuating structures and/or land use within this particular study area.

#### Area 4

Area 4 is bounded on the west by Broadway, on the north by the City boundary, on the east by Pico Boulevard,



and on the south by the Pacific Ocean, Santa Monica Pier area. The common feature of this area is the Santa Monica Freeway. The major land use within Area 4 consists of industrial, commercial, and some multiple-family dwelling units. This area contains very little noise-sensitive land use because commercial and/or industrial establishments border all major arterials.

A few noise-sensitive areas are located adjacent to the Freeway and are in need of remedial noise attenuation measures. These areas are the R-2 developments north of the Lincoln and adjacent to the Santa Monica Freeway on the east. The noise levels in these residential areas range from 57 to 73  $L_{dn}$ . Fortunately, the Freeway is depressed near most of the residential areas which helps to attenuate some of the noise.

The next portion of Area 4 exhibiting high noise levels is near the intersection of Lincoln and the Santa Monica Freeway. Fortunately, most of the land use is industrial with some commercial. However, there are some multiple-family dwelling units just south of Lincoln and Santa Monica High School. Near the Santa Monica Pier, the noise levels range from 63 to 65  $L_{dn}$ . The residential developments within this area are high-density apartments. However, most of the buildings are older and, as such, do not have the structural design and/or physical construction capable of attenuating the noise problem. This area should be prime for additional development or redevelopment.

Area 4 is almost as noisy as Area 3. It is suggested that the City of Santa Monica reevaluate any plans for residential development in light of high noise level conditions.

#### Area 5

Area 5 is located north of 14th Street, east of Pico Boulevard, and south and west of the City boundaries.



The land use within Area 5 is made up of single- and multiple-family units, some industrial and commercial developments and the Santa Monica Municipal Airport. This Area is the most populous zone in the City.

Area 5 noise levels are comparable to Area 1 levels in most cases. In a northern section of Area 5, two areas of residential land use experience very high noise levels. These two locations, one on Ocean Park Boulevard (Site 2) and one on Pico (Site 1), exhibit noise levels of 71  $L_{dn}$  and 76  $L_{dn}$ , respectively. Additionally, one area adjacent to Santa Monica City College (Site 40) exhibits a measured  $L_{dn}$  of 73. In order to improve the existing environment, the City must restructure their circulation system within this area, especially near the College. The College itself is a major traffic generator contributing high noise levels.

The noise measurements conducted underneath the flight path of Santa Monica Municipal Airport indicate that noise levels range from 58 to 68  $L_{dn}$ , with those areas directly under the Airport contours exhibiting noise levels of 62 to 63  $L_{dn}$ . Therefore, it appears that Airport operations themselves are much quieter than automobile traffic around the periphery of Area 5. To confirm this there were two 24-hour measurement sites (Sites 4A and 4B) at the corner of 25th Street and Ocean Park Boulevard. These two sites exhibited measured levels of 63  $L_{dn}$  and 64  $L_{dn}$ . When compared with the site adjacent to the Airport and north of the intersection with a measured noise level of 71  $L_{dn}$ , it can be concluded that traffic in this area is the major source of noise.

#### Area 6

Area 6 is bounded on the west by Pico Boulevard, on the north by 14th Street, on the east by the City boundary,



and on the south by the Pacific Ocean and the City boundary. The general land use within Area 6 ranges from single-family and low-density, multiple-family dwelling units to commercial, (both strip and intermittent), to high-density residential land use and the beach recreational areas.

Noise levels within Area 6 range from 50 to 76  $L_{dn}$ . Within Area 6 there is a strip adjacent to Lincoln Boulevard that is extremely noisy. The noise levels adjacent to Lincoln Boulevard range from 72 to 76  $L_{dn}$ . Fortunately, this portion of Lincoln is developed with rather old, but viable strip commercial land use with most of the buildings being two and sometimes three stories high, which help to buffer sound. The residential and commercial areas closer to the beach have the lowest noise levels in Area 6. This area (Sites 17 and 25) has noise levels ranging from 60 to 68  $L_{dn}$ . Additionally, residences in this particular part of Area 6 are predominately R-3 or multiple-family, higher density residential land use. It is suggested that future development along major streets be two- or three-story commercial and in the residential areas be low density multiple-family which is more easily designed to attenuate noise.

### Conclusion

This analysis has shown that the City of Santa Monica experiences far more noise than the average suburban community. The major contributor to the noise environment within the City is vehicular traffic which permeates the entire City environment.

Table 1 presents a comparison of  $L_{dn}$  noise levels for the entire City and the study areas. The noisiest area of the City is Area 1 which contains the highest socio-economic sector of the City's population. However,  $L_{dn}$  levels for all areas only range from 66.5 to 69.8, a difference of three decibels which is ordinarily not discernible.



Table 1. SANTA MONICA NOISE LEVELS

STUDY AREA	NOISE LEVELS IN L <sub>dn</sub>	
	Range	Average
1	52-71	69.8
2	59-74	66.5
3	62-74	67.9
4	57-73	68.3
5	59-76	67.9
6	60-76	69.2
City Limits	52-76	68.4



Figure 4 portrays the noise-sensitive areas impacted by transportation noise within the City.

#### SOURCE CHARACTERISTICS OF SPECIFIC LAND USES IN SANTA MONICA

While much of the concern about noise relates to the application of proper procedures of land use planning relative to known noise sources, some concern must be exhibited in the planning of uses to the extent that the use itself is a generator of noise. Highway planning, for example, must take into account the noise produced by the motor vehicles to more adequately select routes and noise mitigation measures. There are also distinct general relationships that arise from certain types of land uses which should be taken into account in future planning.

Large areas in the City of Santa include single-family detached dwelling units. Single-family detached dwelling units are considered traditionally to be the most desirable form of residential living by the majority of the citizens. This land use is characterized generally by three- and four-bedroom, single-level houses, (although in certain areas north of Montana there are quite a number of two-story houses), equal setbacks from a street right-of-way, from 10- to 15-feet separation between homes, and large rear yards some of which are adjacent to service alleys rather than being immediately adjacent to the rear yard of adjacent property. The socioeconomic mix within Santa Monica still contains a large number of families of child-bearing age.

Noise sources for such living patterns are characterized by the full range of population noise. Lawn mowers are found in almost every home, mostly powered by gasoline engines, and are usually used every week during the hot period of the year and every 2 to 3-weeks during the cooler



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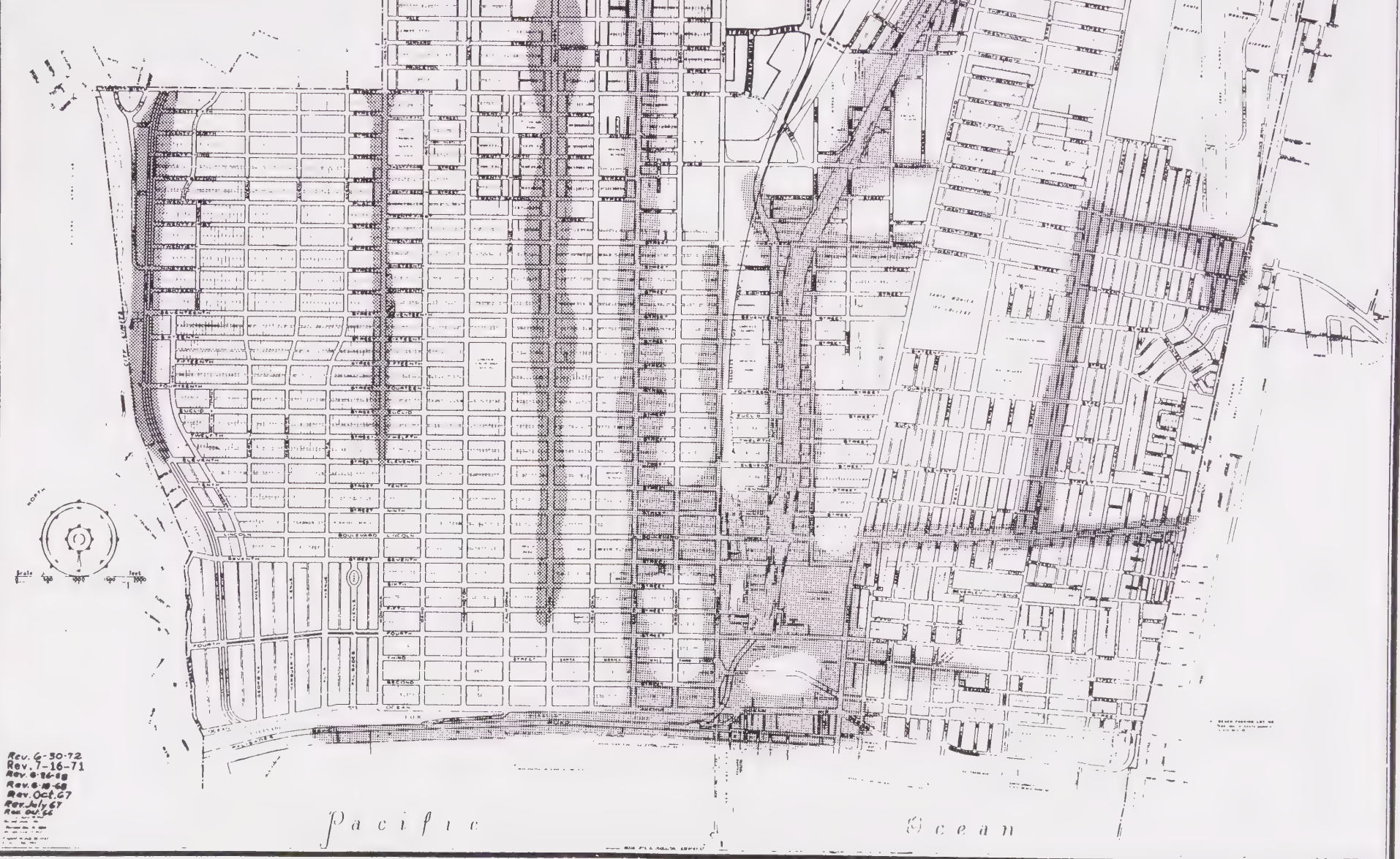


FIGURE 4. NOISE SENSITIVE AREAS



periods of the year. While there is an emphasis toward weekly gardening services in the areas north of Montana, the predominate form of landscape treatment is still by the homeowner.

The increasing crime problem has resulted in an increase in the population of dogs. The dogs are especially for the purpose of alerting homeowners to unwarranted intrusions onto their property, particularly in the evening or night hours. Barking dogs, therefore, serve as a warning device. This source of noise has been one of the focuses of complaint activity in Santa Monica. The barking dog problem can be mitigated to some extent by limitation (and code enforcement) of the number of animals that can be kept in any one location.

Because many of the homes in Santa Monica are older with garages to the rear of the property, driveways often extend between adjacent homes. Thus, motor vehicle noise intrusion into the bedroom areas is quite common during the morning and evening hours. One possible way of mitigating this problem is to encourage access from alley ways to the rear of the property where such access does exist. Many of the homes north of Montana where alleys do exist have access both from the front and rear of the property. In lower income neighborhoods where the motor vehicle population is older, there is a special problem of vehicles in poor repair notably poor mufflers which will produce more vehicle noise in those neighborhoods.

Because of high building costs and the built-up nature of most of Santa Monica, new residential dwelling construction is mostly limited to additions of existing dwelling units by homeowners themselves. Thus, construction is often characterized by periods of intense activity with long periods of nonactivity spreadout over 2 or 3 months as a homeowner finds time or is able to afford the additions. Much of the equipment used by the homeowners is of a quality



considerably less than that used in residential construction and therefore apt to produce more noise. Because of the older homes in the community, and the mature landscaping, homeowners are more apt to be engaged in heavier aspects of landscape maintenance, such as tree removal, heavy pruning, and other forms of maintenance necessitating use of power equipment, particularly chain saws.

In summary, the single-family dwelling unit noise problem is characterized primarily by sporadic events, associated by both daily living and in particular, the maintenance and repair of the property. If these noise contributions are to be lessened, they will only be effective through the increased availability of quieter power tools and to some extent, limitations on the hours in which maintenance and use of power equipment is possible.

#### Multiple-Family Residential Uses

In multiple-family residential use, the living style, the building design, and the building placement on the lot are usually different than in single-family detached residential neighborhoods. As a result, some of the noise problems associated with multi-family units differ.

Within apartments, there is a problem of noise created in one apartment intruding into an adjacent apartment from one of two paths: the adjacent common wall, or from windows of adjacent apartments. In the latter instance, air conditioners mounted in the windows often produce exhaust noise that is bothersome to neighboring apartments, particularly where a similar air conditioning apparatus is not used and windows are left ajar for cooling purposes. Living styles within apartments tends to be more indoor or more centralized within the building site itself, thus the outdoor living areas are usually oriented inward, thereby lessening the impact of recreational utilization to adjacent property



owners. However, within the project itself, this inward orientation of recreational areas can produce noise levels that are bothersome to the individual apartments. Dogs do not tend to be the same problem as in single-family areas because of the lack of outdoor space or prohibitions within the apartment units against animals.

Motor vehicle patterns in apartment complexes is rarely a problem except within the immediate environs of the parking areas. Since in some areas, particularly older apartments, there is inadequate accommodation for all motor vehicles, much of the overflow parking is on the public streets. Thus, there is apt to be more nuisance noise created by motor vehicle operations.

While some complexes have landscaping that requires exterior maintenance to the building structures, it is far more likely that landscaping maintenance is required on the interior of the building sites themselves. Thus, in apartment areas, mowers and other landscape maintenance equipment is not found in nearly the abundance that it is in residential neighborhoods and certainly not nearly as much to the exterior of the building structures themselves.

Because of the large concentration of people in multi-family areas it is often necessary that trash collection be conducted using the large common cannisters. When the trash trucks come for collection, it is usually necessary to fork lift the cannister over the truck into the compaction area. This means there is additional noise generated by the sanitation truck as it powers the fork lifting apparatus. In residential areas, the distribution of trash usually means that a large number of homes can be collected before it is necessary to dump the collection cannister into the compactors. Judicious placement of the lifting apparatus and the utilization of quiet trash trucks is about the only way that this source of noise can be mitigated.



In areas where there is a high density of senior citizens, the noise generated by the multiple residential land uses is similar with the exception perhaps of the motor vehicle trips and the number of visitors. Also, there may be an increased sensitivity to noise particularly during the evening hours and especially if the people moved into an apartment complex with the expectation of having a quiet environment.

In high-rise residential structures the buildings tend to be unit air conditioned with compressors at the roof of the building. These compressors and condensers can be a problem; and accommodation for that problem must be incorporated into the original design of the structures. Adequate design can mitigate most of the noise problems that would arise from this source. Additionally, some high-rise structures are prone to either deliveries or more frequent trash collection depending on the nature of the management of the building. Some senior citizen structures, for example, may have integral dining facilities and laundry service, thereby necessitating delivery and collection of food and laundry that would not be present in other types of multiple-residential living.

Motor vehicles tend to be less of a problem in the high-rise structures inasmuch as it is more likely that the parking areas are in basements or parking structures. Motor vehicle operation noise is thereby muffled by a subterranean location or the walls of the structure. The concentration of multiple residential structures in areas will increase the volume of traffic on the roadways which will in turn, cause the noise levels to increase rather significantly as a function of the number of motor vehicles. It is generally preferable not to concentrate multiple residential dwelling units, although there are other reasons why concentration may be desirable for the City.



## Commercial Land Uses

Santa Monica commercial land uses cover a wide range of services. Most commercial uses are not in themselves serious noise generators. Since most commercial uses are air conditioned, compressors are the most common source of noise. This is particularly true of commercial uses that require refrigeration equipment such as liquor stores, freezers, and markets. For the most part, commercial uses are viewed as generators in the context that attract motor vehicles into an area and, therefore, serve as an indirect source of noise. This problem, it might be pointed out, is the same one that has confronted the Environmental Protection Agency relative to automotive chemical emissions. Since noise is a transitory phenomena, in that it is present only when the source is present and is absent immediately as the source is either turned off or removed, the environmental noise problem caused by shopping centers and other commercial uses is not nearly as severe as it is for air pollution. However, commercial uses by their very nature draw motor vehicles into an area and for that reason can be a particular nuisance especially if there is abutting residential land. The only adequate way to deal with the generation issue is to distribute commercial uses in a manner that avoids concentration of motor vehicles or to locate them in a manner that is easily accessible by public transit. Strip commercial development tends to slow down motor vehicle traffic resulting in more interruptions of the traffic flow and resulting changes in the acceleration of the vehicles. This acceleration/deceleration pattern generally tends to produce more noise and a greater variation in the noise. Often, variation in noise levels is more bothersome than steady noise levels. The highly developed land use patterns, in Santa Monica make it difficult to relocate commercial uses in a manner more satisfactory from a noise perspective.



## Industrial Land Uses

Industrial land uses for the most part have characteristics similar to commercial uses as they relate to the generation of noise. There is a probability, however, that the industrial areas will have more variety of noise sources. This is particularly true where outdoor fabrication and industrial plant activity is permitted as part of the manufacturing zone. The movement of trucks, such as fork lifts on the site, the setting down of heavy loads, the construction of subassemblies (for example, certain types of lumber yards) are examples of where an outdoor industrial use can potentially be a poor neighbor. Over the last 10 years, there has been a tendency in southern California away from outdoor usage of industrial sites with more emphasis on enclosing various industrial operations, thereby reducing on-site noise levels. Certain industrial operations are served by heavy diesel truck traffic, such as warehousing. Thus, industrial activity can draw noise sources into an area and the routes through which those sources arrive at the industrial area are of some critical concern in terms of the secondary impact produced by the industrial location. In some industrial areas, outdoor loud speakers, whistles, warning, and signaling devices maybe used. These devices can be a major source of annoyance in an neighborhood, even if that neighborhood is relatively far removed from the exact location. Here, it is not the level of noise that is bothersome, but the unique characteristic of the sound that distinguishes it from others in a neighborhood. The problem is somewhat similar to the issue that arises with outdoor lighting of commercial and industrial locations where it is not the intensity of the light that bothers the neighborhood, but rather the character of the site that is created during night illumination, giving the visual impression of intensity.



In addition to trucks being drawn into an industrial area, railroad service can produce both direct and secondary impacts in Santa Monica depending on the type of service required by the industrial activity. The blowing of whistles, crossing and signaling devices, and other related railroad noise can be bothersome at the industrial site itself, but it is more likely to be bothersome on the access routes to the industrial areas.

### Special Problems

Two situations deserve special attention in relation to the use of land in Santa Monica. First, there is the problem of the mobile home. Mobile homes are characteristically thought of as being "temporary" uses. Thus, mobile home parks are found in Santa Monica in locations not normally considered acceptable for residential living. They are found in proximity to commercial land uses and industrial land uses, highways and heavily traveled roadways. Santa Monica will have to address whether or not it can continue to treat mobile home living in this manner or whether better site design, better location criteria, and improved coach design is more satisfactory in terms of long-range community noise planning.

The second situation is the noise associated with emergency vehicles. Ambulances, fire trucks, and police cars are equipped with emergency warning devices and are primarily utilized to facilitate movement of these vehicles through traffic. Each of these vehicles possesses a distinctly different warning apparatus producing a unique sound. While the warning devices all tend to have all-directional characteristics, for the most part they radiate significant amounts of noise to the side of the vehicles. Some people complain about such warning devices or about the excessive use of such warning devices. Warning devices are specifically



exempt from design controls by the Environmental Protection Agency. The only way in which the noise environment produced by such devices will ever be improved is in the use of the devices themselves. Discriminate use of the devices is the only way in which usage can be stipulated without compromising the safety and the occupants of these vehicles.

## CITIZEN INPUT

Noise is ranked highly on the list of concerns for neighborhood and general urban quality by the citizenry of Santa Monica. A community survey indicated that noise was the urban characteristic most in need of improvement. This concern was shared by both home owners and renters in the City.

In response to these community concerns, the Citizens Advisory Committee prepared a list of noise control goals and objectives for adoption by the City Council. These have been included in this Element. In addition, the committee has been actively participating in the development of the Noise Element. It is important that citizens continue to be involved and support efforts for a quieter environment in Santa Monica.

## NOISE STANDARDS AND CRITERIA

Several interrelated issues must be considered in the development of noise standards and criteria for Santa Monica. Every community desires a quiet environment. Achieving noise levels considered acceptable as a community standard is easier for some communities than it is for others. The City of Santa Monica has  $L_{dn}$  noise levels equivalent to a noisy urban area. Due to its developed



nature and established transportation system, Santa Monica must give greater accomodation to noise than a less developed city. In addition, noise control of some of the noise sources predominant in the City is outside the City's jurisdictional limits.

Most importantly, noise control standards and criteria should be consistent with those in noise enforcement. As desirable as it may be, it is impractical to apply an enforcement standard that cannot be met under current noise conditions. At the same time, noise standards should become more stringent as technology provides easier and less expensive methods for attenuating noise. Current standards and criteria should reflect economic as well as environmental objectives and should be realistically enforceable from a legal and technical standpoint.

The City of Santa Monica should make two distinctions concerning the effects of noise: health and annoyance. The first priority will be to alleviate noise conditions that endanger the health of Santa Monica citizens. This health/noise level is  $70 L_{eq}$  ( $76 L_{dn}$ ) which is the level requisite to prevent hearing loss in nearly 100 percent of the population, as established as a guideline by the Environmental Protection Agency. The second priority will be to provide noise levels below annoyance and activity interference levels in order to create a quality living environment for citizens. The Environmental Protection Agency has established the guideline of  $55 L_{dn}$  as that level above which outdoor activity interference and annoyance will occur.

In view of these issues, Santa Monica will incorporate the following standards and criteria into a program for comprehensive noise control. They are:

- o Adopt a maximum permitted level that conforms to the levels requisite to protect public health and that considers land use/noise interrelationships ( $70 L_{eq}$  or  $76 L_{dn}$ ).



- o Adopt standards and criteria for planning and new construction which conform to noise levels that are acceptable for reliable speech communication and prevent annoyance and activity interference ( $55 L_{dn}$ ).
- o Adopt an enforcement standard which is 5 dBA higher than planning standards for a period of 5 years. After 5 years, the enforcement standard should be modified to match the planning standard.
- o Redesignate noise-sensitive land uses in noise-impacted areas to more compatible land use (See Action Programs).

Table 2 presents the Basic Planning Standard which will protect health and prevent annoyance and activity interference for a variety of land uses encountered in Santa Monica. These general standards give first priority to assuring the residential areas are free from excessive or annoying noise levels by establishing quantitative maximum permissible noise levels.

## OPPORTUNITIES, OBSTACLES AND CONSTRAINTS

Both opportunities and constraints exist for the City of Santa Monica's efforts to achieve a quieter environment.

The greatest opportunity involves the City's willingness to implement positive action programs to reduce community noise levels. Many of these opportunities exist in the Motor Vehicle and Municipal Codes. The Motor Vehicle Code is stringent and if strongly enforced, would reduce high noise levels associated with transportation systems.



Table 2. BASIC OUTDOOR PLANNING STANDARD

Community-wide Maximum Permitted Noise Level	70 $L_{eq}$ (76 $L_{dn}$ )
Residential	55 $L_{dn}$
Educational	55 $L_{dn}$
Hospitals	55 $L_{dn}$
Recreational Areas	55 $L_{dn}$
Commercial	65 $L_{dn}$
Industrial	70 $L_{dn}$



The Municipal Code can also effectively control population noise problems if strictly enforced. A summary of opportunities is as follows:

1. Existing noise control efforts based on the Motor Vehicle and Municipal Codes.
2. A commitment to noise control efforts as evidenced by the adopted Noise Control Goal and Objectives.
3. Growing State and Federal efforts in achieving noise abatement.
4. Availability of local governmental techniques directed towards the noise path and receiver capable of achieving noise reduction in the City.
5. Measurement survey data which provides baseline noise levels in the City.

One of the greatest obstacles and constraints to noise control efforts is economics. Noise attenuation measures such as the construction of physical barriers, property acquisition, and noise insulation are expensive for both the citizen and the City. An enforcement program is also costly and entails manpower and equipment experiences. Constraints also exist in efforts to obtain State and Federal aid to assist and supplement City funding. Another constraint is the political overtones which occasionally accompany designations of noise problem areas. Some of these obstacles and constraints can be summarized as follows:



1. Preemption of noise source control by the Federal and State governments.
2. Highly developed land use and transportation patterns.
3. Limitation of funds for noise control efforts
4. Existing high noise levels in some noise-sensitive areas of the City.
5. Divergent opinions on acceptable community noise levels.



## IMPLEMENTATION

Implementation is the most important aspect of the Noise Element because it involves programs designed to fulfill the goal, objectives, and recommendations identified in the study of Santa Monica's noise environment. The implementation of these action programs should lead to a quieter environment for citizens of Santa Monica. It is paramount that these programs be both flexible and enforceable. This criteria is especially important in Santa Monica because of its highly developed, yet changing land use patterns.

## PRIORITIES FOR NOISE CONTROL EFFORTS

Noise control efforts should be directed at the major noise sources identified in the Methodology section. Their order of importance is as follows:

1. Transportation noise (surface and air)
2. Population noise
3. Construction noise
4. Industrial noise



## RECOMMENDATIONS

### Transportation Noise

#### Surface Transportation

The noise survey and contour analysis indicated that surface transportation is the primary noise source in Santa Monica. The most effective noise control measures will be focused directly at the noise path and receiver and indirectly at the source because direct control of transportation sources is preempted by the Federal and State governments.

The City of Santa Monica should work for reduction of noise from transportation facilities by supporting Federal and State efforts in this area and by actively enforcing existing regulations such as the California Motor Vehicle Noise Standards (California Vehicle Code). The Motor Vehicle Code prohibits the operation of motor vehicles in excess of specified noise limits (Section 23130); requires registered motor vehicles be equipped with an adequate muffler maintained to prevent excessive or unusual noise (75150); prohibits the sale or installation of an exhaust system or muffler unless it meets the regulations and standards (75150.1-8); prohibits the modification of a vehicle exhaust system in a manner which amplifies or increases the noise (27151); regulates new motor vehicle noise limits (27160); regulates motorcycle noise limits (27161); and regulates new off-highway motor vehicle noise limits (38280). Motor vehicles which violate these standards are often a primary source of annoyance in a community. Constant traffic noise is often more acceptable than single sources which exceed the specified noise levels.



The Police Department is the agency which is responsible for enforcing these sections of the Motor Vehicle Code. Unfortunately, this Department is often overburdened with more severe enforcement responsibilities which hamper noise control efforts. This problem is an area which must be worked out between the City Council and the Police Department. Enforcement of the noise standards will, however, reduce or eliminate the number of annoying noise sources in Santa Monica and contribute overall to a quieter environment in the City.

The Police Department can issue warnings and citations under Section 23130 (et al) of the State of California Motor Vehicle Code, during normal operations. A police officer may subjectively evaluate any motor vehicle without being required to take on-the-spot measurements. The outcome of any warning or citation for loud or modified mufflers would be that the vehicle owner would be required to furnish proof or disproof of the officer's citation, not the City. Therefore, the costs of enforcement for the City hopefully would not increase over what is currently budgeted for normal police operations.

The City can also indirectly control transportation facilities by regulating traffic flow. The City should make a careful study of existing speed limits because noise levels generated by automobiles are generally greater at higher speeds. Speed limit designations, however, must take into account driving conditions and circulation as well as noise. Another technique to reduce noise is by continuing to synchronize traffic lights to improve traffic flow and reduce unnecessary stop-and-go activities which contribute to high noise levels. Stop-and-go traffic can also be affected by carefully evaluating the number of pedestrian crosswalks which create such situations. One-way streets may also be effective in improving traffic flow.



Because noise levels increase with an increased percentage of heavy trucks, it is useful to regulate the volume of trucks. The latter step is important until 1988 when truck noise emissions will be reduced, as required by the California Motor Vehicle Code, to levels equivalent to most current automobiles. The City should limit truck volume or usage on streets which have large numbers of residential dwellings. A careful reevaluation of truck patterns may indicate changes in established truck routes. Limiting truck movements to day hours (7:00 a.m. to 10:00 p.m.) on truck routes having residential dwellings is another feasible alternative.

Public transportation provided by the Municipal Busline and Southern California RTD is beneficial in efforts to create a quieter environment in Santa Monica. Public transportation tends to decrease the volume of traffic on City arterials. This effect, however, may be counterbalanced by the fact that diesel-powered buses produce noise levels 5 to 10 dBA higher than automobiles. In general, two automobiles together would produce a noise level equivalent to the noise level generated by a bus. For example, per State law, any vehicle with a gross weight rating of 6,000 pounds and manufactured after 1974 and before 1978 must meet a regulation of 83 dBA at a distance of 50 feet from the center line of travel. A motor vehicle under 6,000 pounds gross weight (typically a standard passenger automobile) will have to meet a regulation of 80 dBA at a distance of 50 feet from center line.

Public transportation, therefore, may or may not contribute to lowered community noise levels. The effect on Santa Monica noise levels is dependent on the mix of buses and vehicles on a particular arterial, the choice of bus routes, and the types of buses. With existing diesel- or gas-powered buses, often as much as 30 percent of the vehicular traffic must be replaced by public transportation for a reduction in community noise levels.



The City of Santa Monica can promote the benefits of public transportation without contributing to high community noise levels. The City owns and operates the Municipal Busline and thus is directly responsible for bus noise emissions. These noise emissions can be reduced by proper maintenance and operation of the buses. The purchase of additional buses should be preceded by consideration of electric or other quieter buses. Careful consideration of bus routes may eliminate unnecessary travel through noise-sensitive areas.

Motorcycle noise can only be reduced through enforcement of the Motor Vehicle Code. Active enforcement of the Code in relationship to motorcycles will develop an enforcement reputation for the City of Santa Monica which will deter offenders.

#### Air Transportation

Air transportation noise in Santa Monica is created by aircraft operating from Santa Monica Municipal Airport and Los Angeles International Airport. The California Department of Aeronautics Noise Regulations, pursuant to the declaration by the Los Angeles County Board of Supervisors, has declared Santa Monica Municipal Airport to be a "problem" airport. The regulation requires that the Airport maintain compatible land use within the 70 CNEL noise contour until 1986. After 1986, the Airport is expected to maintain compatible land uses within the 65 CNEL noise contour. Adherence to the requirement of compatible land uses within the 70 CNEL contour must be attested to quarterly by the Airport. Furthermore, the Airport is required to establish a monitoring system to validate the 70 CNEL contour and subsequently to monitor and verify adherence to the requirements of the noise regulation. The Municipal



Airport can, on its own volition, institute regulations above and beyond those of the California Noise Regulations, but it may not have regulations less stringent than those required by the State law. Any regulations above and beyond that of the California Department of Aeronautics Noise Regulations may be subject to court challenge as either unconstitutional or broaching an area of regulations previously preempted by either the State or the Federal Government.

Historically, local airports have found it difficult to institute restrictions on aviation noise, inasmuch as most of the functional remedies fall within areas of regulations already preempted by the Federal government. Such preemption has not always meant that the Federal government has actively occupied the field with legislation, particularly legislation designed to regulate usage of the airfield or flow of commerce. The preemption on a passive basis by the Federal government has been the source of a great deal of frustration and ultimately has led to many attempts by local agencies to occupy this area of legislation, if for no other reason, than to serve as a nuisance and a notice to the Federal government. Their patience on the lack of Federal action is rapidly running out.

In recent years, precipitatory action by local airports has led to legal challenge in the courts to test the extent of the Federal preemption and more clearly delineate the demarcation between local responsibility and Federal responsibility. Each case is currently being judged on its own merits. Therefore, it can be said that the nation is in the process of establishing for the first time through the legal process, the precedence for the scope of Federal preemption and the scope of local option.

Since most of the cases are resolved in favor of the Federal government, or restrict the right of the local airport operator to regulate aircraft noise, new and innovative ideas are continuously being tried by local airports in



an attempt to find a remedy that the courts will not declare beyond the scope of local option. For this reason it is impossible to judge, a priori to a legal determination, what methods or procedures will or will not work. Those that had been allowed to the local operator are limited in number. In almost all cases, the permitted regulation of airport noise is framed within a very finely drawn context of the legal spectrum of preemption.

The most successful of these regulations is instituted at Los Angeles International Airport, which effectively restricts overflights east of the Airport between the hours of 12:00 midnight and 6:30 a.m. While on the surface, it appears that the Airport, through this action, is regulating aircraft in flight (a procedure strictly forbidden to local airports), technically, the Airport accomplishes its goal by regulating the closure and opening of its runways, a procedure that is permitted under Federal regulation. The elimination of overflights of the area east of LAX is only the effect of a permitted cause, not a direct regulation of the Airport itself. Further, within the context of Federal law, Los Angeles International Airport is restricting its operations on the runways utilized by jet aircraft which constitutes a "class of aircraft" under Federal definition. Their regulations would be declared as unwarranted by the FAA if the Airport declared it was restricting its activity to aircraft of a certain make, engine configuration, or noise level.

Noise, as a direct issue within the regulations, only surfaces in that certain aircraft are permitted to land and takeoff providing they conform to Federal Air Regulation Part 36. Here, Los Angeles International Airport used as its noise guideline a Federal regulation. Therefore, Los Angeles International Airport is operating within the scope of existing Federal law. While such distinctions may appear to



be insignificant on the surface, they are in fact the very items on which the Airport has been able to successfully maintain its program of noise noise regulation.

Therefore, any airport, including Santa Monica, that chooses to institute regulations designed ultimately to eliminate noise produced by overflights, must do so in a way that fits carefully and strategically within the context of existing and well defined Federal regulation and does not venture into an untested field of regulation for which no precedent has been established in the courts on the issue of Federal versus local options. It is for this reason that uniquely designed programs for airports which specifically address the issue of noise are technically unable to withstand the test of preemption in the courts. To the extent that the Municipal Airport engages in such unique or clever manipulations, it can expect that concepts will be tested and that there is a very high probability that the regulations will be rejected as a means for controlling noise.

In the instance of enforcement of the California Noise Regulations, the municipality is in a unique position in that it can employ the principles of the California Noise Regulations within its own land use planning policies, zoning regulations, subdivision regulations, and so on, to carry out the intent of the noise regulation while acting in its capacity as a municipal government. However, in its capacity as an airport proprietor, there may be some problem for the Airport if the California Noise Regulations were struck down in a court test. A portion of the regulations, the single-event noise violation level has already been struck down by a court decision. Therefore, it is far better that the concepts embodied within the California Noise Regulations be incorporated within the land use policy of the municipal government, thereby circumventing a direct confrontation between the Airport as a proprietor and the Federal Aviation Administration.



In reference to the Airport rules regulating the Municipal Airport in subsection 6, page 6, the Airport has established an SENEL limit as a function of measurement positions exclusively established to confirm the CNEL values for noise contour construction. This section would be clearly void under recent court decisions. The SENEL limit has been declared as nonoperative because it regulates aircraft in flight, a field preempted by the Federal government. Subsequently, all other sections relating to this subsection would be declared as nonoperative also. Furthermore, any action contemplated as a result of a violation of this subsection would be declared null and void.

While the Airport can choose to engage temporarily in a form of harassment utilizing this ordinance, it should be advised that it will not likely stand the test legally in the courts. Furthermore, it is likely that any investment in municipal revenues to defend an action brought by a plaintiff against this regulation is not apt to be productive in terms of sustaining the regulation itself. Those portions of the ordinance which restrict the operation of jet aircraft may be sustainable as a local option. Jet aircraft constitute a class of aircraft and maybe prohibited under current definitions of the "class." It should be pointed out again that the Airport, as the proprietor, may choose to institute procedures "a priori" that serve to harass the aircraft operators currently allowed to operate nonjet aircraft at the airfield. If such regulations or harassment is engaged in under the disguise of enforcement of this ordinance, then it is unlikely that such action would be sustainable in court.

In summary, therefore, the Airport's current approach to regulation clearly needs some alteration. Such changing would be to very carefully draw a program under the clearly defined rights of airport proprietors and local



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In summary, therefore, the Airport's current approach to regulation clearly needs some alteration. Such changing would be to very carefully draw a program under the clearly defined rights of airport proprietors and local



agencies in the area of aircraft regulation, not necessarily noise regulations. Using the broader concept of airport regulations, as allowed to proprietors, it may be possible to construct a program that achieves the effect of noise regulation without doing so directly and certainly within the context of well-established airport law.

### Population Noise

Noise complaint data on file in Santa Monica indicates that the major nuisance noise sources are barking dogs and musical instruments and/or stereos. These types of noise are adequately covered by the Santa Monica Municipal Code. The Municipal Code provides the means of enforcing and/or quieting obnoxious or offensive noises from stationary or nuisance-type sources.

The solution to abatement of population noise sources lies in enforcement of the Municipal Code. Enforcement of the Code is often hampered by enforcement efforts and surveillance activities of more serious crime. The proper balance between nuisance and crime enforcement will be worked out between the City Council and the Police Department.

Residential and other noise-sensitive land uses can be further protected by setbacks, buffer zones, sound-proofing, building sound transmission control, and open space allocation.

### Construction Noise

Construction noise is not a major problem in Santa Monica at the present time. Construction activities, however, do have the potential to be disruptive of human activities because of sporadic and intermittent high noise levels.



Santa Monica can continue to avoid the problem of construction noise by limiting construction activities to daylight hours (7:00 a.m. to 7:00 p.m.) and business days (Monday through Saturday) which are less noise-sensitive. Construction noise levels can also be limited to specified noise levels at the property line. These maximum noise limits often ensure more careful planning of construction activities such as placement of equipment on the site, improved maintenance of equipment and installation of muffler systems. The City can also place the consideration of noise among other considerations when accepting bids and awarding contracts for construction services.

### Industrial Noise

The manufacturing district in Santa Monica is consolidated in two areas which eliminates some of the problems associated with industrial noise. The one area is the Municipal Airport which is zoned M2. This problem is dealt with in Air Transportation Noise.

The other manufacturing district is located on the northwest side of the Santa Monica Freeway. A manufacturing zone is considered a compatible land use with a high noise generator such as the Freeway.

A problem does exist where residential land use borders industrial land use without a buffer zone, such as the areas in the vicinity of Princeton and Broadway and Berkeley and Pennsylvania. A noise ordinance establishing allowable noise levels at adjacent property lines would allow greater noise levels for adjacent industrial use but lower noise levels for adjacent residential land use. Industrial firms producing high noise levels would be requested to attenuate noise levels or apply for a variance if compliance is not possible.



## EXISTING FEDERAL AND STATE STANDARDS

Noise regulation standards and guidelines have been adopted on the Federal, State and local governmental levels for the purpose of protecting citizens from potential hearing damage and various other noise-associated adverse physiological, psychological, and social effects.

The first Federal efforts regulating noise were issued by the Department of Labor in 1969 establishing noise as an occupational health hazard. As a result, two legislative acts have been enacted that regulate noise from industrial fixed-point sources which result in hearing loss. The Walsh-Healey Public Contracts Act, as amended, includes provisions for occupational noise regulations. Failure by a corporation to comply with the established standards may result in the corporation's removal from a list of bidders eligible for Federal contracts.

The Occupational Safety and Health Act (OSHA) of 1970 sets noise exposure standards as follows for all businesses engaged in interstate commerce:

Table 3. PERMISSIBLE NOISE EXPOSURES

Duration, Hours Per Day	Sound Level dBA
8 - - - - -	90
6 - - - - -	92
4 - - - - -	95
3 - - - - -	97
2 - - - - -	100
1 - - - - -	105

In 1972, Congress enacted the Noise Control Act. This act authorized the Environmental Protection Agency (EPA) to publish descriptive data on the effects of noise and establish levels of noise "requisite to protect the



public health and welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels) as follows:

Table 4. SUMMARY OF NOISE LEVELS REQUISITE  
TO PROTECT PUBLIC HEALTH AND WELFARE

Effect	Level
Hearing Loss	70 dB <sup>1</sup>
Outdoor activity interference and annoyance	55 dB <sup>2</sup>
Indoor activity interference and annoyance	45 dB <sup>2</sup>

<sup>1</sup>Averaged over a 24-hour period ( $L_{eq}$ ).

<sup>2</sup>Averaged over a 24-hour period with a 10-dB nighttime (10:00 p.m. to 7:00 a.m.) weighting ( $L_{dn}$ ).

The levels are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. The EPA cautions that their identified levels are not standards because they do not take into account the cost or feasibility of the levels. The EPA concludes that 24-hour continuous noise levels should be below 70 dBA to minimize the risk of hearing loss. For outdoor and indoor environments, interference with activity and annoyance will not occur if levels do not exceed 55  $L_{dn}$  and 45  $L_{dn}$ , respectively.

The Federal Highway Administration (FHWA) and the Department of Housing and Urban Development (HUD) are two Federal agencies that have established noise level criteria for various types of land use. The FHWA has established noise standards for land use criteria for use in the planning and designing of highways as shown in Table 5. These standards apply for Federal and State highway projects.



Table 5. DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

Noise Level <sup>1</sup>	Description of Land
60 (Exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need - i.e., amphitheaters, parks and open space.
70 (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sport areas, and parks.
75 (Exterior)	Developed lands not included in the above categories.
55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

<sup>1</sup>Maximum continuous noise level exceeded 10 percent of the time during the day (L<sub>10</sub>).

Exterior noise levels apply to outdoor areas which have regular human use and in which a lowered noise level would be of benefit. The noise level values need not be applied to areas having limited human use or where lowered noise levels would produce little benefit. The indoor level relates to indoor activities where no exterior noise-sensitive land use or activity is identified.

HUD has established policies for granting financial support for the construction of residential dwellings in noise-impacted areas as shown below:



Table 6. EXTERNAL NOISE EXPOSURE  
STANDARDS FOR NEW CONSTRUCTION

---

<u>Acceptable</u>	- Does not exceed 45 dBA more than 30 minutes per 24 hours ( $L_2$ ).
<u>Discretionary</u>	- Normally acceptable - does not exceed 65 dBA more than 8 hours per 24 hours ( $L_{33}$ ).
<u>Discretionary</u>	- Normally unacceptable - exceeds 65 dBA 8 hours per 24 hours ( $L_{33}$ ).
<u>Unacceptable</u>	- Exceeds 80 dBA 60 minutes per 24 hours ( $L_4$ ). Exceeds 75 dBA 8 hours per 24 hours ( $L_{33}$ ).

---

Any noise environment that exceeds 65 dBA for 8 hours per day is considered normally unacceptable and requires certain measures to reduce noise levels in the living quarters. Also, noise reduction methods need to be presented to the Regional Administrator of the Federal Housing Authority (FHA) for approval before financial assistance or support is granted. Beyond these requirements, HUD personnel at the local level must assess the acceptability of noise exposure in indoor sleeping areas. These areas are considered acceptable if the noise levels:

Interior

...do not exceed 55 dBA for more than ... 60 minutes in any 24-hour period ( $L_4$ ) and do not exceed 45 dBA for more than 30 minutes ... from 11:00 p.m. to 7:00 a.m. ( $L_6$ ) and do not exceed 45 dBA for more than ... 8 hours in any 24-hour day ( $L_{33}$ ).



The State of California has also adopted noise standards in areas of regulation not pre-empted by the Federal government. State standards regulate noise levels of motor vehicles and motor boats, establish noise impact boundaries around airports, regulate freeway noise affecting classrooms, set noise insulation standards and establish noise planning standards as shown in Tables 7 and 8. The California Motor Vehicle Code Standards are in Table 7.

The California Department of Aeronautics has set noise standards governing airports which operate under a valid permit issued by the Department. The regulations are designed to create cooperation among airport proprietors, aircraft operators, local governments, pilots, and the Department in efforts to diminish noise. The regulations do this by controlling and reducing the noise in communities in the vicinity of airports.

The State has also established noise-land use planning standards in Section 65302(g) requiring a Noise Element to the General Plan:

. . . (g) A noise element in quantitative, numerical terms, showing contours of present and projected levels associated with all existing and proposed major transportation elements. These include but are not limited to the following:

- (1) Highways and freeways,
- (2) Ground rapid transit systems,
- (3) Ground facilities associated with all airports under a permit from the State Department of Aeronautics.

In addition, the California Council on Intergovernmental Relations (CIR) has issued guidelines in the preparation of noise elements that both modify and extend the content as prescribed by the legislative mandate.

State noise insulation standards are outlined in two separate documents. The primary noise insulation regulator is the 1973 edition of the Uniform Building Code,



Table 7. STATE OF CALIFORNIA MOTOR VEHICLE NOISE STANDARDS

Description	Noise Standards (dBA values at 50 feet unless noted otherwise)		
Operation of vehicles at posted speeds (Section 23130)	Effective Date	35 MPH or less	Over 35 MPH
1. Motorcycle 2. Vehicle with a GVW of 6000 lb. or more (or combination) 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle	Before 1/1/73 After 1/1/73	85 88 86 76	86 90 90 82
Sale of new vehicles (Section 27160)  1. Motorcycles manufactured 2. Motorcycles, other than motor driven cycles manufactured   3. Vehicle with a GVW of 6000 lb. or more   4. Any other motor vehicle	Before 1970 After '69, Before '73 After '72, Before '75 After '74, Before '78 After '77, Before '88 After '87,   After '67, Before '73 After '72, Before '75 After '74, Before '78 After '77, Before '88 After '87   After '67, Before '73 After '72, Before '75 After '74, Before '78 After '77, Before '88 After '87	92 88 86 80 75 70   88 86 83 80 70   86 84 80 75 70	92 88 86 80 75 70   88 86 83 80 70
Noise level limits for the operation of off highway motor vehicles (Section 38280)	Any vehicle manufac- tured on or after 1/1/72 before 1/1/73 after 1/1/73 before 1/1/75		92   88



Table 8. STATE OF CALIFORNIA NOISE STANDARDS, DESIGNATION, ETC.

Description	Noise Standards (dBA values at 50 feet unless noted otherwise)
<p>Establish Noise Impact Boundary around airports</p> <p>New Airports</p> <p>Existing large airports</p> <p>Existing small airports</p>	<p>(in CNEL units at ground level)</p> <p>65 dB</p> <p>Before 1/1/76      80 dB After 1/1/76      75 dB After 1/1/81      70 dB After 1/1/86      65 dB</p> <p>Before 1/1/76      70 dB After 1/1/81      65 dB</p>
Noise Insulation Standards	<p>After 8/22/74 (in CNEL units)</p> <p>45 dB interior</p> <p>60 dB or greater requires analysis</p>

CNEL = Community Noise Equivalent Level



(UBC), Appendix Chapter 35. A secondary document related to the implementation of the UBC is the California Administrative Code, Title 25, Chapter 1, subchapter 1, Article 4, which requires acoustical insulation in areas subjected to 60 dB or greater in order to maintain an annual interiors level of 45 dB in any habitable room of a multiple dwelling unit.

The various standards and guidelines are difficult to compare because they are expressed in different measurement indices. As a result, the various regulations cannot be readily converted to one measurement index because of the different parameters (i.e., environmental conditions, time weighting, duration, etc.) associated with the original indices.

## ACTION PROGRAMS

Existing local noise control efforts on the behalf of the City of Santa Monica include the enforcement of the Motor Vehicle Code, Municipal Code, State Noise Insulation Standards, Uniform Building Code, and Airport Ordinance. These existing programs will be supplemented with the addition of new action programs.

The following action programs comprise a comprehensive program of noise control efforts aimed at achieving the goal and objectives of the Noise Element. These noise control efforts will be guided by the following principles.

Noise Standards and Criteria - The standards and criteria outlined under Methodology shall be applied uniformly for all areas of Santa Monica. These standards are based on noise levels that are requisite to protect the public's health and welfare and will enhance the quality of life in Santa Monica.



Advocacy - Much of the noise impact on Santa Monica is created by sources or agencies outside the City's jurisdiction. In particular, traffic noise regulation is primarily preempted by the State government, and the regulation of aircraft noise is largely preempted by the Federal government. As a result, the City of Santa Monica should utilize its influence to change the policies and programs of other levels of government in order to improve the noise environment of Santa Monica.

This can be done at the legislative stage by informing State and Federal legislative representatives of the City's desire to achieve a quieter environment. At the regulatory stage, Santa Monica should provide input on proposed rulemaking by Federal and State agencies. For example, the Federal Register contains advanced and regular notices of proposed rulemaking by the Federal Aviation Agency and others. Subscription to certain noise publications such as the Noise Regulation Reporter will keep the City up to date on noise issues and laws. Active participation in an organization such as N.O.I.S.E. (National Organization to Insure a Sound-controlled Environment) is a form of advocacy.

Legal Actions - The City of Santa Monica should be prepared to initiate legal action whenever necessary in an effort to achieve a quieter environment.

The action programs designed to create a quieter environment in Santa Monica are directed toward noise problem areas. Some of the action programs encompass a short-, medium-, or long-range effort to solve noise problems in Santa Monica.



## Program Number One - Improve the Existing Noise Environment

The City of Santa Monica has noise levels comparable to a noisy urban area. These noise levels are high enough to cause interference with normal speech communication in the outdoor environment. This existing noise environment can be improved as follows by the implementation of short-range programs:

- o Enforce sections of the Motor Vehicle Code and Municipal Code related to noise.
- o Adopt and enforce bus and truck routes.
- o Continue to synchronize traffic lights to improve vehicular flow and reduce unnecessary stop-and-go traffic.
- o Limit the use of horns, bells, or sirens to emergency situations.
- o Restrict the noise level output generated by heavy construction equipment by requiring the use of adequate exhaust and intake mufflers and soundproofed enclosures.
- o Reduce high construction noise levels by requiring the erection of temporary sound barriers.
- o Require stationary noise-generating equipment to be enclosed with sound-absorbing materials.
- o Adopt and enforce a noise ordinance.



- o Designate the Police Department as the Noise Enforcement Agency.
- o Provide information on noise and noise abatement measures to interested citizens.

Program Number Two - Prevent Future Noise Problems Through An Integrated Planning Process

Medium-range programs for achieving a quieter environment in Santa Monica are based on actions that are closely interrelated with other community issues. As such, these programs require a longer time frame to assess the proper balance of noise control and other issues.

- o Where appropriate, initiate zone changes to create land uses compatible with the noise environment.
- o Strengthen the City's liaison efforts with the Federal, State, and other local governmental entities to coordinate noise control programs.
- o Encourage the Los Angeles County Health Department's efforts to establish a community noise enforcement program.
- o Continue to develop affirmative programs improving the noise environment associated with air transportation at the Santa Monica Municipal Airport.



- o Consider the purchase of quieter buses by the Santa Monica Municipal Busline and encourage the Southern California Rapid Transit District to do likewise.
- o Study and evaluate truck and bus routes in relationship to noise-sensitive land uses.
- o Require that new buildings near high noise generators such as the Airport and Freeway be more adequately soundproofed by the use of noise absorbent materials and special construction techniques.
- o Encourage citizens to use alternative modes of transportation to automobiles which will reduce traffic noise throughout the City.
- o Require that all new industrial buildings be constructed with sound-absorbant materials.
- o Require that noisy industrial equipment that cannot be kept indoors be enclosed or directed toward nonsensitive land uses.

Program Number Three - Set Measurable Goals for the Reduction Of Noise in Santa Monica

Measurable changes in the noise environment of Santa Monica will only be discernible over an extended time frame. Long-term programs will be able to monitor any noise reduction in the City.



- o Monitor community noise levels periodically for comparison with the 1975 measurement survey.
- o Update and revise the Noise Element in relationship to social and technological changes in the Santa Monica noise environment.

#### Program Number Four - Establish Planning Guidelines For Current and Future Planning Programs

Planning guidelines provide more flexibility than noise standards by incorporating considerations of technological feasibility and economic viability in addition to health and welfare concerns in the decision-making process. Planning guidelines are primarily a preventive approach to noise pollution. These guidelines allow the City to review land use changes and redevelopment actions in relationship to compatibility with noise standards.

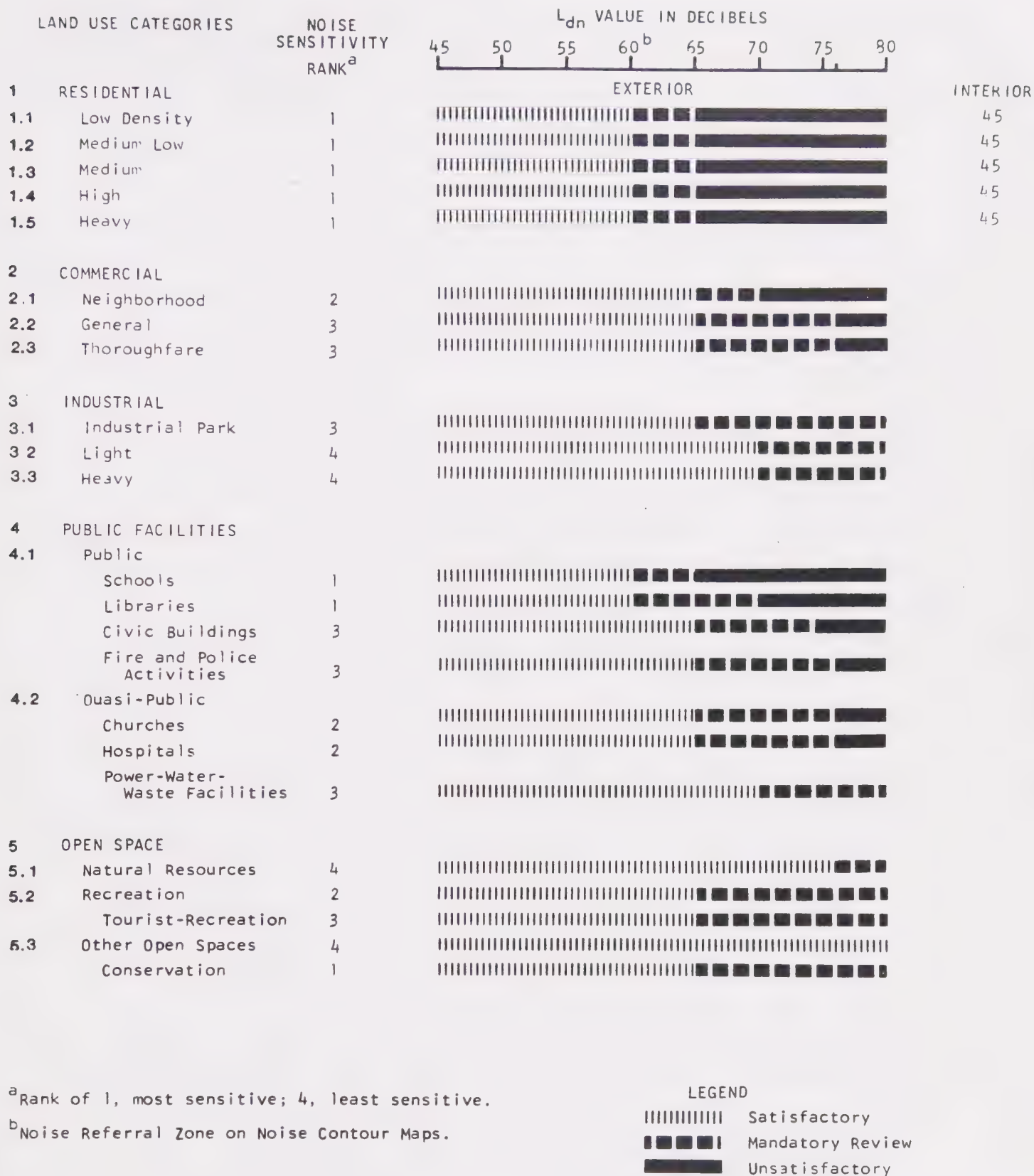
The planning guidelines for Santa Monica take three forms: a Land Use Compatibility Chart, a Noise Referral Zone portrayed on the noise contour maps and a Zoning/Noise Compatibility Chart.

The Land Use Compatibility Chart is shown on Figure 5. This figure presents noise levels allowed for the various land uses identified in the 1990 Land Use Element for the City of Santa Monica. These levels are defined as follows:

Satisfactory - Noise levels in the exterior environment are compatible with the proposed land uses and will not create annoyance and activity interference. If a land use falls in this category, no additional noise studies or attenuation measures will be imposed on the builder.

Mandatory Review - Noise levels are great enough to require study on the compatibility of the proposed land use. The proposed land use should be evaluated on a





**FIGURE 5. LAND USE COMPATIBILITY CHART FOR COMMUNITY NOISE IN SANTA MONICA**



project-by-project basis to determine potential noise mitigating measures in the form of site plan and structural design methodologies. In addition, existing land uses which lie in this category will have secondary priority for remedial sound attenuation measures. These remedial measures include physical barriers, structure insulation, and redesignation of land use for future redevelopment into a more compatible use. The City will utilize the contour maps to determine when a project is in need of review. If the proposed project is located near or within a noise contour, then the developer may be required to provide an on-site acoustical survey.

Unsatisfactory - Noise levels are severe requiring a detailed analysis of the noise environment in relationship to the compatibility of the proposed or existing land use. Noise attenuation features will be necessary in the basic design and/or rehabilitation of a site to ensure the protection of persons occupying that particular land use. Existing land uses which fall into this category will have first priority for remedial sound attenuation treatment and/or redevelopment.

Another planning guideline exists in the noise contour maps (Figure 6 and 7). The noise contours depicted on these maps reflect transportation noise sources, which are and will remain the major noise-generating sources in Santa Monica. The contours shown on these maps indicate noise-affected areas which are referred to as noise referral zones. The noise referral zone acts as a triggering mechanism for any proposed change, such as a building permit or zone change, in an area affected by adverse noise levels. If a proposal falls in a noise referral zone, the change would be referred to the Environmental Impact Review Committee or the Planning Department for evaluation and review.

To further identify land use/noise compatibilities, a noise/zoning matrix has been prepared. Figure 8 displays zoning categories presented in the Land Use Element



CITY OF  
SANTA MONICA  
CALIFORNIA  
DEPARTMENT OF ENGINEERING  
EXISTING NOISE CONTOURS 1975

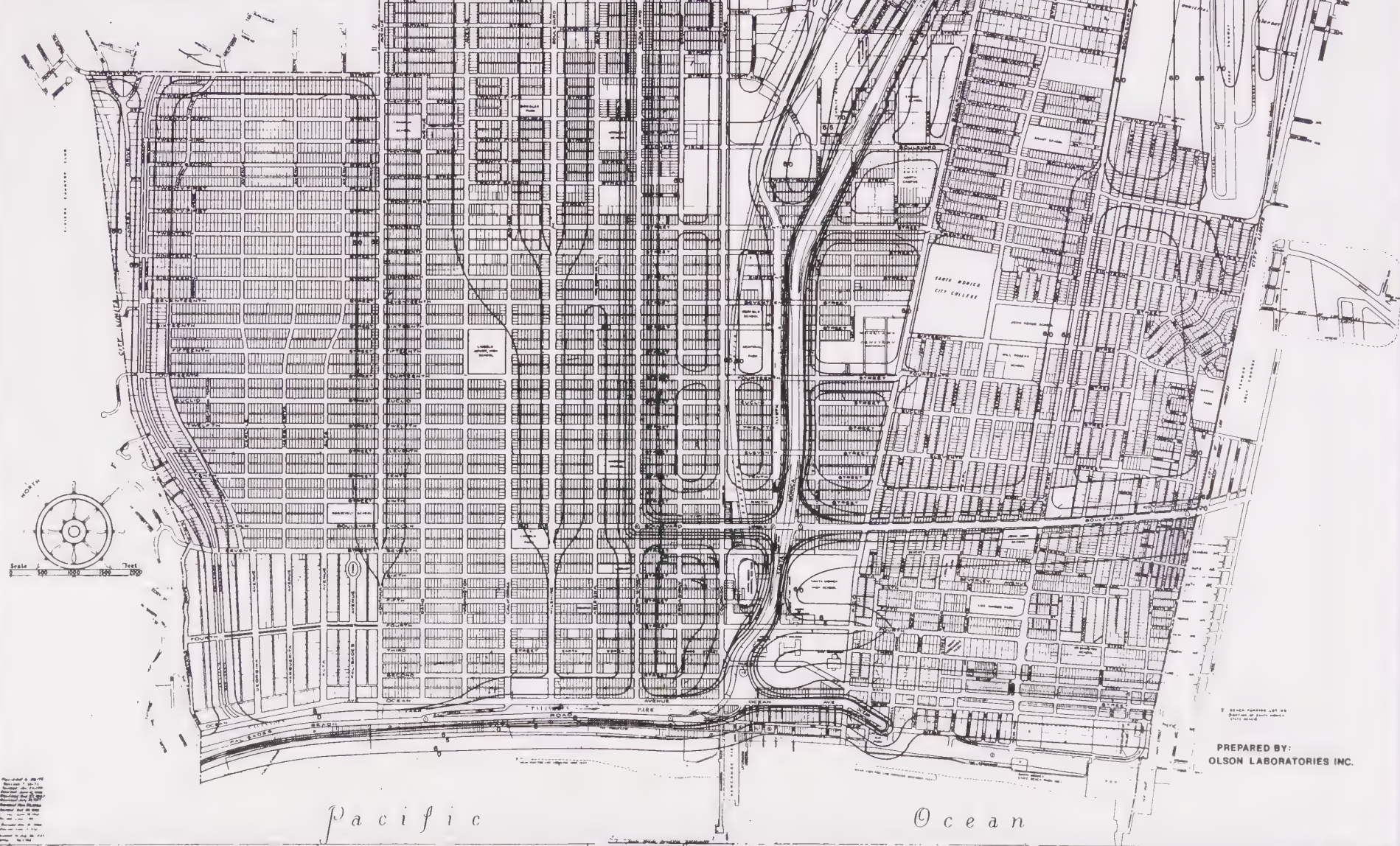


FIGURE 6.



CITY OF  
SANTA MONICA  
CALIFORNIA  
DEPARTMENT OF ENGINEERING  
PROJECTED NOISE CONTOURS 1990

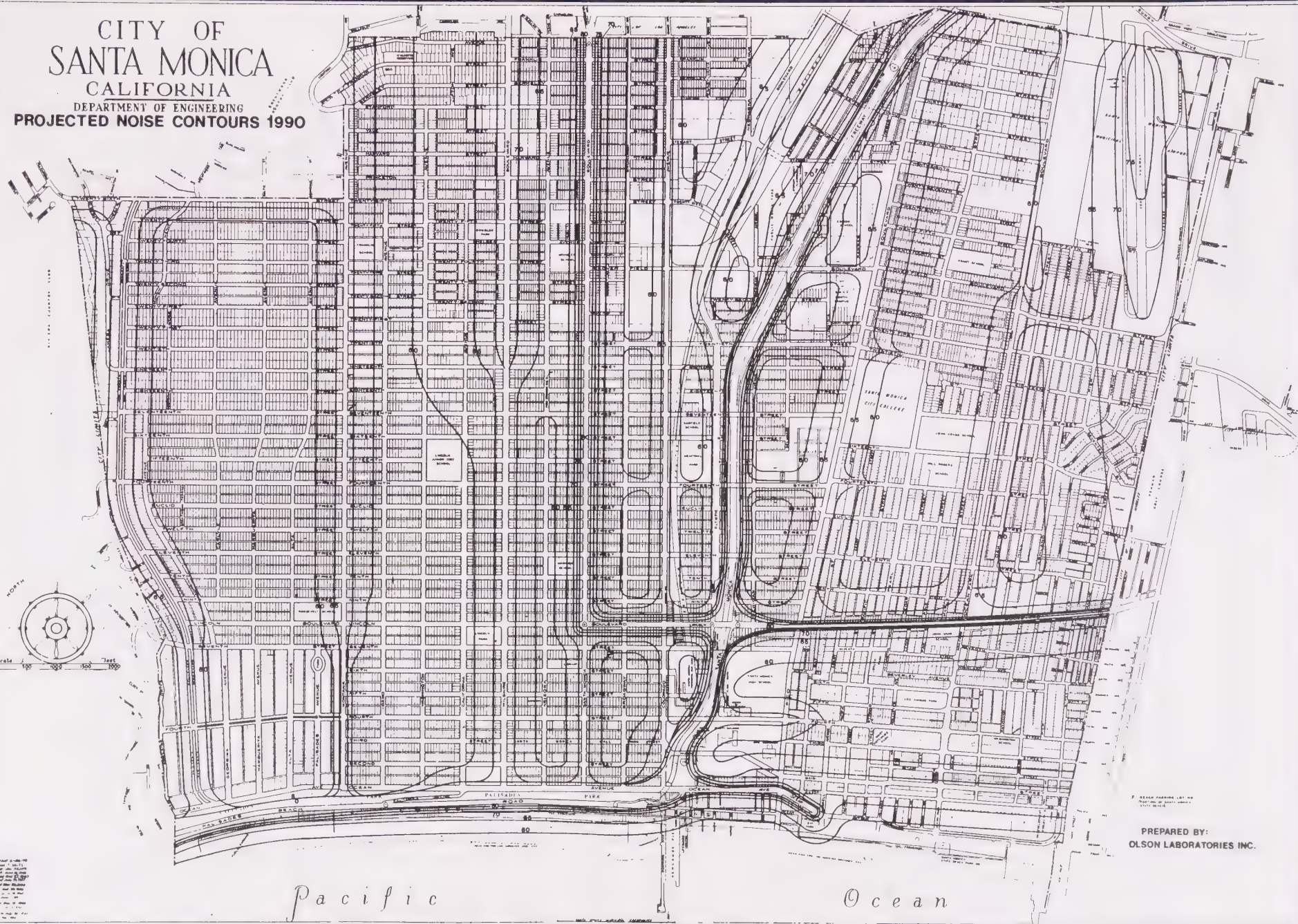


FIGURE 7.



## NOISE COMPATIBILITY OF LAND USE

	R-1	R-2	R-3	R-4	A	CA	CP	C2	C3	C4	C4A	CR	M1	M2
R-1	1	1	1	2	2	3	3	3	4	4	4	4	4	4
R-2	1	1	1	2	2	3	3	3	4	4	4	4	4	4
R-3	1	1	1	1	1	2	2	2	3	4	4	4	4	4
R-4	2	2	1	1	1	1	1	1	2	2	2	2	3	4
A	2	2	1	1	1	1	1	1	1	1	1	1	1	1
CA	3	3	2	1	1	1	1	1	1	1	1	1	2	3
CP	3	3	2	1	1	1	1	1	1	1	1	1	1	2
C2	3	3	2	1	1	1	1	1	1	1	1	1	1	2
C3	4	4	4	2	1	1	1	2	1	1	1	1	1	2
C4	4	4	4	2	1	1	1	1	1	1	1	1	1	2
C4A	4	4	4	2	1	1	1	1	1	1	1	1	1	2
CR	4	4	4	2	1	1	1	1	1	1	1	1	2	3
M1	4	4	4	3	1	2	2	2	2	2	1	2	1	1
M2	4	4	4	4	1	3	3	3	2	2	2	3	1	1

1. MOST COMPATIBLE -SENSITIVE LAND USE
2. COMPATIBLE -SENSITIVE LAND USE
3. marginally COMPATIBLE -LESS SENSITIVE LAND USE
4. UNCOMPATIBLE -NONSENSITIVE LAND USE

FIGURE 8.



and Zoning Code and ranks them accordingly to noise sensitivity. A noise sensitivity rank of (1) indicates the most sensitive, and a rank of (4) indicates the least sensitive. Additionally, the matrix has been set up for the relative sensitivity of one land use adjacent to another land use, thereby illustrating the fact that industrial and residential land uses are totally incompatible when juxtaposed to each other.

Program Number 5 - Adopt a Mechanism for Citizen Participation and a Noise Information Dissemination Service to Create Citizen Awareness and Support for Noise Control Programs

The success of the noise standards depends on the voluntary compliance of the citizenry. Periodic inspection and checks are all that can be implemented without prohibitive municipal costs. In addition, most municipal inspection will rely on the complaints and inquiries of citizens to reveal violations. If this response can be linked with a reliable system of communication permitting citizens to report noise violations readily, the effectiveness of the noise control program will be increased.

Citizen participation has already occurred in the development of the Noise Element through the Citizen's Advisory Committee and the Planning Commission. Citizen participation should be continued by utilizing the Environmental Review Committee as a clearing house for projects impacted by noise. The Environmental Review Committee, in turn, would send these projects in need of further review and/or variance to the Planning Commission. Citizen awareness can be fostered by the provision of noise information pamphlets and campaign by the City. Close coordination should be maintained between the City and the businesses of Santa Monica as their cooperation is necessary for an effective noise control program.



Program Number 6 - Establish Guidelines for Site-Specific  
Noise Review

Specific design solutions for noise problems are dependent upon temporal and spatial characteristics unique to each site. The bulk of structures and/or placement of the structure does not in itself create noise. Structure characteristics that indirectly effect noise include "the canyon effect" and density. A canyon effect involves two opposing rows of high buildings which result in an echo reflection of sound. This canyon effect also acts as a barrier or berm by blocking high noise levels for areas behind the high buildings. Conversely, the density of the land use itself has a relationship to the amount of noise that is indigenous to the area. A high density population area generates a high traffic density and thus a greater amount of noise.

The noise attenuating effects of buildings are shown on Table 9.

Table 9. BUILDING ATTENUATION

BUILDING TYPE	WINDOW CONDITION	NOISE REDUC- TION DUE TO EXTERIOR OF STRUCTURE*	CORRESPONDING HIGH- EST EXTERIOR NOISE LEVEL WHICH WOULD ACHIEVE AN INTERIOR DESIGN NOISE
		dB	dBA
All----- Light Frame--	Open----- Ordinary Sash:	10	65
	Closed--	20	75
Masonry-	Single Glazed--	25	80
	Double Glazed--	35	90

\*Noise reduction factors higher than those shown may be used when field measurements of the structure in question indicate that a higher value is justified.



Buildings can also be utilized to attenuate noise through proper site design. If a proposal calls for a structure to be built adjacent to a noise source such as a freeway, then the exposed side of the building and the related floor plans can be designed so that the wall presents a solid surface. All windows, vents, and other normal openings should be placed away from the noise source.

Site design is one of the most effective means of protecting dwelling units in a noisy environment. If a project is proposed adjacent to a freeway or expressway, the building layout can effectively attenuate noise by placing the dwelling units as far away from the noise source as possible and placing the nondwelling buildings and driveways between the dwelling units and the noise source. Figures 9 and 10 depict the possible ways of designing buildings and sites to help attenuate unwanted noise.

Noise attenuating barriers can effectively reduce noise levels but are accompanied by high costs. Current estimates are running \$40 per linear foot for a 10 to 12 foot masonry barrier. The effectiveness of the barrier depends on the relative height of the barrier, the noise source, the affected area and the horizontal distance between the source and the barrier and between the barrier and the affected area. For example, a 10-foot barrier would be ineffective in attenuating noise generated from a 10-foot high exhaust stack.

At the same time, barriers are often the only measures available to attenuate adverse noise levels. They can effectively be intergrated into the architectural design of a proposed project at little or no extra cost if they are initiated in early planning stages. Table 10 shows possible noise reduction from barriers.



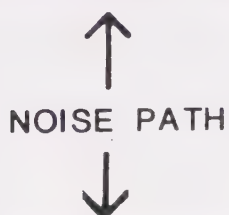
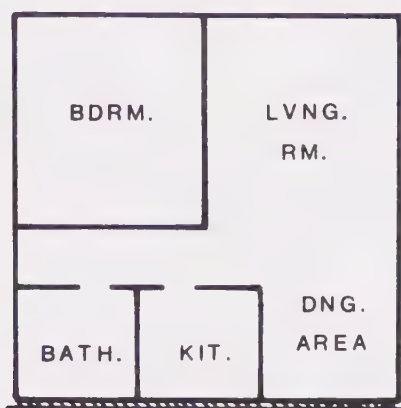
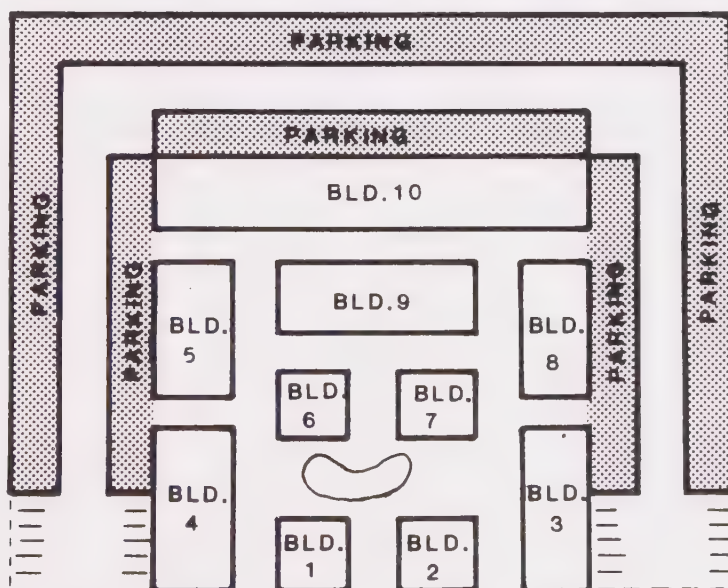


FIGURE 9.

FREEWAY



SITE DESIGN FOR THE ATTENUATION OF NOISE

FIGURE 10.



Table 10. BARRIER NOISE REDUCTION

Type	Noise Reduction
Earth Berm <sup>1</sup>	up to 15
Block Walls <sup>2</sup>	up to 15
Trees and Shrubs <sup>3</sup>	3 to 5

<sup>1</sup>The berm must be high enough to block line-of-sight situations

<sup>2</sup>Block walls must be high enough to block line-of-sight situation. Walls must be long enough to prevent noise from going around the ends of the structure

<sup>3</sup>Trees and shrubs must be mature and at least 100 feet in depth in order to attenuate noise by 3 to 5 dB.

Landscaping produces little physical noise reduction unless it is very dense and of significant depth. Its benefits include aesthetics and the possibility that it may change sound frequencies. Landscaping can also be beneficial by beautifying setbacks that attenuate noise. Figure 11 illustrates landscaping effects on noise reduction.



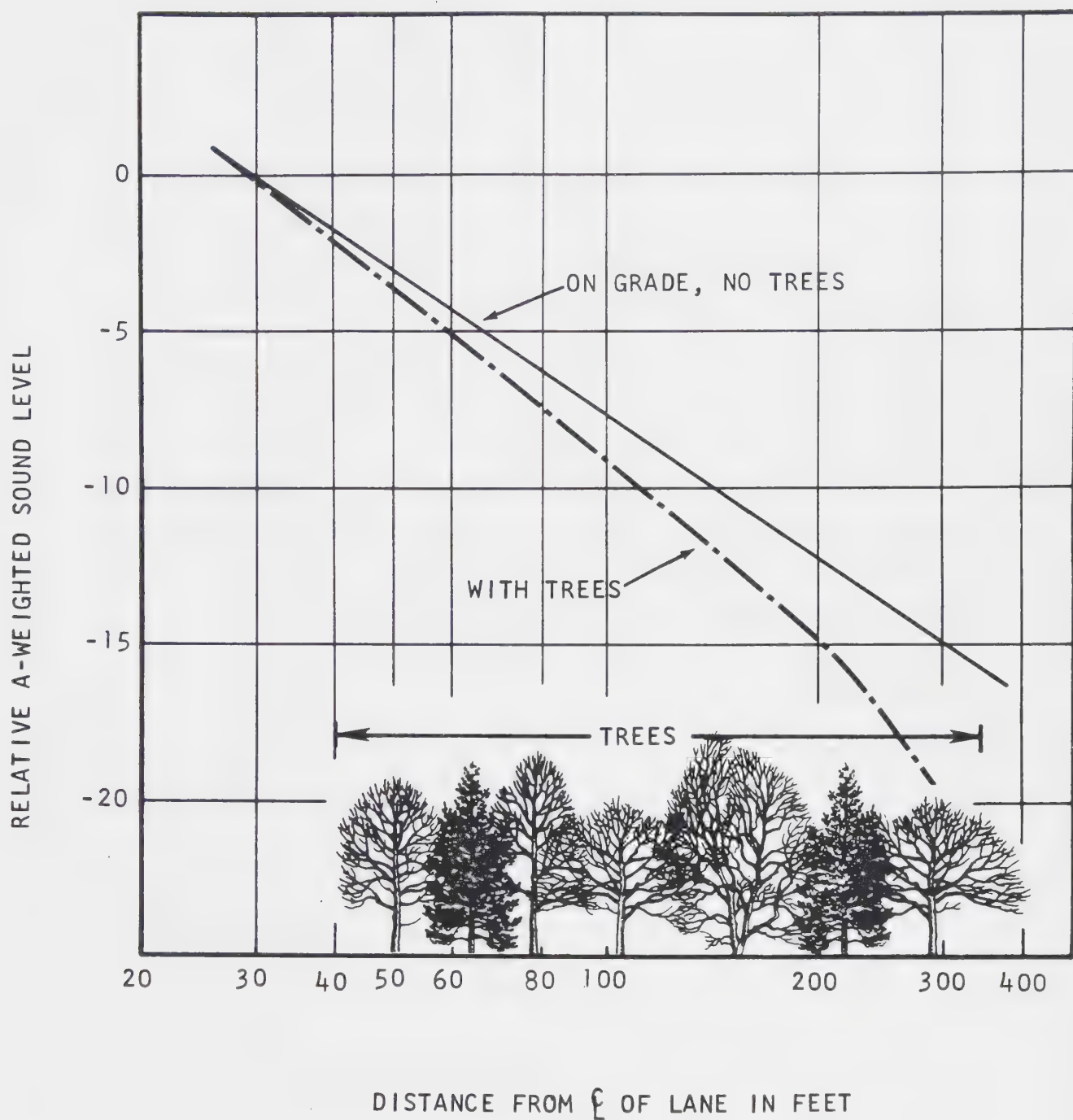


Figure 11. NOISE REDUCTION WITH OR WITHOUT TREES



## ENVIRONMENTAL IMPACT

The Noise Element of the General Plan consists of a statement of community goals and policies, the identification of community noise sources, and a program for the reduction of noise and minimization of its impacts. The Environmental Impact Report attempts to analyze the effects of the policy and program recommendations of the Noise Element in the City of Santa Monica. The EIR was prepared in accordance with Section 15037 (a)(1) of the amended State guidelines for Environmental Impact Reports which defines a project as including the adoption of local general plans or elements thereof pursuant to Governmental Code Section 65100-65700.

The EIR appears in the Noise Element as follows:

<u>EIR</u>	<u>Page No.</u>
Introduction	1
Description of Existing Environment	17
Description of Proposed Project	49
Environmental Impact	85

### A. ENVIRONMENTAL IMPACT

The policies and programs of the Noise Element are directed toward achieving noise levels that will not jeopardize



the health and welfare of the citizens of the City of Santa Monica. As such, the implementation of the Noise Element will create impacts both negative and beneficial in the following areas:

1. Landform - Implementation of this Element may cause alterations in landform due to design measures (e.g., earth berms, walls) utilized to attenuate noise primarily from ground transportation sources. The magnitude of this impact will vary depending upon the proximity of noise-sensitive land uses to transportation routes.
2. Social - Noise affects every facet of human existence - work, sleep, recreation, and education. Noise can be annoying and, in some instances, can cause physical and psychological damage. Noise may be particularly adverse in group interactions by limiting man's ability to communicate. The Noise Element will not contribute to any adverse social impacts of this nature and may relieve some. The Noise Element may, however, alter development trends in the City which could result in social impacts. Noise attenuating measures such as barriers could break up established neighborhoods. Increased setbacks might cause higher density or a change in land use.
3. Economic - The costs of noise and noise control programs are appreciable. The costs are estimated to range between \$500 to \$15,000 for the acoustic insulation of a house. The



true costs to the City and/or homeowner will fall somewhere in between. Many of the Noise Element programs can be integrated into existing departmental procedures without additional manpower or costs. The enforcement of noise abatement programs ultimately will have to be borne by the taxpayer in some form. The recommendations in this Element will require the provision of additional services to make the public aware of the effects of noise and to handle and enforce noise-related problems.

4. Aesthetics - Noise attenuating measures such as barriers may result in adverse visual impacts, depending upon the architectural and landscaping treatment given a particular wall.
5. Open Space - The Noise Element will result in both beneficial and adverse impacts for open space. Open space may buffer noise-sensitive land uses or be noise-sensitive itself.
6. Noise - The Noise Element should result in the reduction of noise or the minimization of its impacts, both beneficial impacts.
7. Air Quality - Noise attenuating measures for ground transportation such as designated truck routes and slower speed limits, may result in increased concentration of air pollutants.



8. Water Resources - The Noise Element will not impact water resources.

B. MITIGATION MEASURES AND CONDITIONS PROPOSED TO MINIMIZE THE IMPACT, INCLUDING BUT NOT LIMITED TO MEASURES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY CONSUMPTION OF ENERGY

Mitigation measures to minimize adverse impacts resulting from the Noise Element are as follows:

1. Noise Attenuation Measures - The utilization of sound absorption material within homes and buildings provides an additional benefit besides noise reduction. Proper insulation can retain heat and decrease the consumption of energy necessary for heating purposes.
2. Landform - Changes in landform can be accompanied by landscaping to improve the visual appearance.
3. Costs - The benefits of a noise control program in providing a quality environment will be increased efficiency, higher property values, fewer hearing difficulties, improved health, and maintenance of a quiet society. Certain noise-attenuation programs already mandated by the State and Federal governments will bear a portion of the costs.

C. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The unavoidable adverse effects associated with the Noise Element are:



1. Minor alterations of landform due to construction of noise attenuation measures.
2. Increased costs to enforce noise control programs, construct attenuation measures, and provide for additional services.

D. ALTERNATIVES TO PROPOSED PROJECT

The Noise Element contains a number of recommended policies focusing on the abatement and control of noise for the benefit of the citizens of Santa Monica. Various other alternatives to the proposed project are considered below.

1. "No action" alternative - This alternative was rejected because the Noise Element is required by State law. If the City did not comply, other levels of government would assume leadership in areas of noise reduction and the City would play a subordinate role.
2. "Minimum action" alternative - This alternative is directed at adopting a Noise Element that satisfies the minimum requirements of the State law. Current noise levels within the City are expected to continue to rise in the future if comprehensive noise abatement programs are not implemented. This alternative was not adopted since it did not offer a positive attack on the City's noise environment.



3. "Maximum action" alternative - This alternative would attempt to lower noise levels to the greatest degree that will protect the health of citizens. This alternative would have far-reaching and significant impacts of its own. All major surface transportation facilities would require redesign or the construction of attenuating walls and/or berms to reduce noise levels. Effective truck routing would be an essential component to reduce noise; however, total vehicle miles might increase as a result, thereby increasing city-wide air pollution emission totals. Property around high noise sources would have to be purchased displacing people and increasing costs substantially. These are only a few of the primary and secondary impacts which would result from the implementation of the "maximum action" alternative. This alternative was, therefore, rejected because of the prohibitive costs to the City's economy, mobility, and overall environment.
4. "Other standards" alternative - The Noise Element could have been based on different standards. Other standards could have been more restrictive (EPA, "Summary of Noise Levels Identified as Requisite To Protect Public Health and Welfare With An Adequate Margin of Safety"), or less restrictive (FHWA, "Design Noise Level/Land Use Relationships"). The choice of different standards could entail more or fewer costs to the City.



This alternative was not chosen in favor of the standards incorporated in the Noise Element which were felt to balance environmental quality and economics.

E. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Over the short-term, the Noise Element for the City will cause disruption to existing and proposed landforms, traffic patterns, revenue allocation, and the commitment of energy and resources. This Element will lead to the long-term improvement of the noise environment of the City in addition to better health for all residents.

F. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF ENERGY SUPPLIES AND OTHER RESOURCES SHOULD THE PROJECT BE IMPLEMENTED

Irreversible environmental changes involved in implementation of the Noise Element are as follows:

1. The commitment of energy and resources to construct and maintain noise attenuating efforts and monitor the results.
2. Alterations to landform.
3. Expenditure of funds to implement and service noise programs.



4. Transportation Alternatives - Alternative means of transportation such as mass transit, bus lines, bicycle lanes, pedestrian facilities, and car pooling may result in noise reduction and at the same time reduce energy consumption in transportation.

G. THE GROWTH-INDUCTING IMPACT OF THE PROPOSED ACTION

There is no direct growth-inducing impact involved in the implementation of this element. There may be secondary growth-inducing impacts in that some land uses may be encouraged or discouraged in certain areas by the addition of increased noise regulation and noise/land use planning controls.

The policies of the Noise Element will not result in increases in population or transportation. The Noise Element will, hopefully, reduce or minimize noise problems from the natural growth in these areas.



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